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The Essex Naturalist:

BEING THE

JOURNAL

OF THE

ESSEX FIELD CLUB,

EDITED BY

WILLIAM COLE, Assoc.L.S., F.E.S.,

Honorary Secretary and Curator.

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The Authors alone are responsible for the statements and opinions contained in their respective papers.

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THE BIRDS OF ESSEX.

A CONTRIBUTION TO THE

NATURAL HISTORY OF THE COUNTY.

Being Volume II. of the "Special Memoirs."

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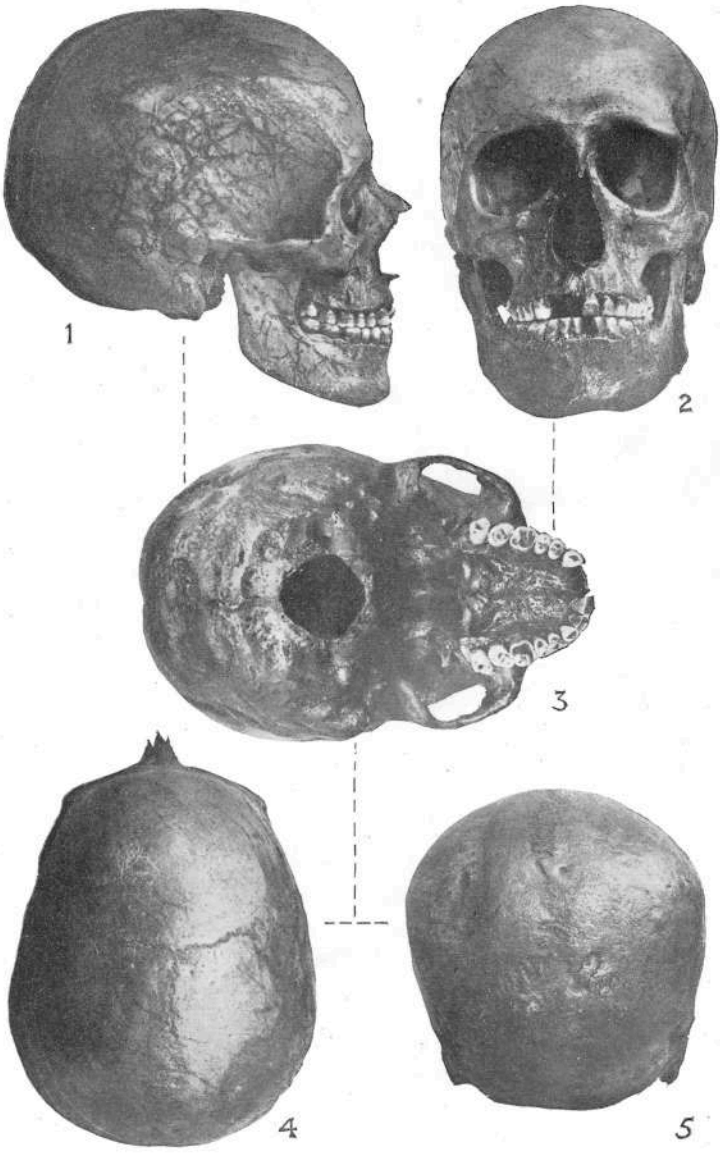


SKULL FROM PREHISTORIC INTERMENT NEAR WALTON-ON-NAZE.

REPORT ON MARINE SPECIMENS DREDGED FROM THE ESTUARIES OF THE ORWELL AND STOUR ON THE OCCASION OF THE CLUB'S DREDGING EXPEDITION, 23 JULY, 1910.

By HENRY WHITEHEAD, B.Sc.

[*Read 29th October* 1910.]

THE specimens obtained from the Orwell and Stour in July last were handed to me as Assistant-in-charge of the Museum during the absence of the Curator. They had been preserved temporarily in a 6% solution of formalin in sea-water. This solution was changed for one of 4% in tap-water, but the Crustaceans and Sponges were transferred to 75% spirit. The bulk of the material has been mounted permanently in rectangular specimen jars, and is now exhibited in the Museum.

The sea-weeds, preserved in formalin, were sent to Mr. E. M. Holmes, F.L.S., who had kindly undertaken to name them. His report is appended. The sea-weeds have since been floated out and mounted as herbarium specimens; duplicate specimens being kept in formalin for microscopic examination if necessary.

I take this opportunity of acknowledging the help thus rendered by Mr. E. M. Holmes; by Prof. W. A. Herdman, F.R.S., who named the specimens of Tunicata; and by Dr. W. T. Calman and Mr. R. Kirkpatrick, both of the British Museum, who examined and named most of the Crustacea and Sponges.

The Sea-weeds, Sponges, and Hydrozoa were carefully examined and washed, and the washings sieved. By this means, a number of small Crustaceans and Pycnogonida were obtained. Dr. Calman's examination of this material has yielded some interesting results, notably a number of specimens of a small Pycnogon, *Ammothea echinata*, found on Hydrozoa and sea-weeds. Dr. Calman says "So far as I know, there is only one East Coast record for . . . [this] species (*A. echinata*) and that a very old one from Seaham." Dr. Sorby spent a good deal of time dredging in the Orwell, but his list of Pycnogonida[1] does not contain this species, and it is scarcely likely that its occurrence would have been overlooked by such a keen observer. The circumstance may probably be explained when we realise how

1 *Victoria History of Essex*, vol. i. (1903), p. 81.

quickly the character of the fauna on the floor of tidal rivers changes. Dr. Sorby has called attention to this in a paper on "Variations in numbers and habitat of Marine Animals on the Coast of Essex during the last ten or twelve years."[2] As this paper deals largely with the particular part of the Orwell in which the Pycnogons were found, I venture to quote at length as follows:—

"Until a few years ago, the bottom of the Orwell at Pin Mill was almost entirely free from mud and was, to a large extent, covered with Sponges, *Alcyonidium*, and compound Ascidians. The number of *Caprella linearis*, a small *Terebella* (*Nicolea zostericola*), and the curious worm, *Siphonostoma diplochaitos*, was astonishingly great; and a larger number of different species of animals could easily be obtained by dredging than in any other place along the coast. In 1898 and 1899, however, I found the bottom covered with a fine tenacious mud, built into short stout soft tubes by enormous numbers of the small Amphipod, *Jassa pulchella*, which had increased so much as to have smothered and almost exterminated most of the animals previously living at the bottom. There had been little, if any, change in the mud banks left dry at low water, nor any marked change in the animals living there. To my surprise, I found the bottom clean in 1900, near Pin Mill, though lower down the bottom was more muddy than it used to be. In 1901, the bottom was clean, and there was a most extraordinary number of small specimens of simple Ascidians, to the almost complete exclusion of other animals. Probably some of these changes have been due to the extensive dredging operations carried on to improve the navigation to Ipswich, and perhaps in a few years the original conditions may be restored."

It is interesting to note that not a single specimen of *Jassa pulchella* has been found in the material obtained in July last, although the mud was quite in evidence, while specimens of *Caprella linearis*, *Alcyonidium*, and Sponges were again plentiful.

An Amphipod (*Unciola crenatipalma*), found this year in the estuaries, is of interest, as it has apparently been recorded only once from the East Coast, at Cullercoats.

Dr. Calman concludes his letter with the remark:—"It would be well worth while for someone to take up the matter seriously and to work at some of the smaller Crustacea of the Essex Coast, for there seems to be very little known about them."

From the records available, it would appear that, of the Crustacea and Pycnogonida captured on this expedition, eight species are new to the county.

The Mollusca proved particularly uninteresting, as the majority of the species found are represented by dead shells.

2 ESSEX NATURALIST, vol. xii. (1901), pp. 17-21.

An item of special interest was the finding of large numbers of the beautiful Purple-tipped Urchin (*Echinus miliaris*) just off Harwich.

A full list of species is given below. Those marked * are apparently new records to the county ; but as the lists of Essex Marine Invertebrates are very scattered and imperfect, it is not well to be too definite upon the point :—

TUNICATA.

Ascidiella virginea, O. F. M. Several.

Styelopsis (Cynthia) grossularia, Van Ben. On stones and *Laminaria* fronds.

Botryllus schlosseri, Pall. Chiefly on colonies of *Alcyonidium gelatinosum.*

MOLLUSCA.

Gibbula (=Trochus) cinerarius, L. A few, living.

G., sp ?

Purpura lapillus, L. A few, dead.

Buccinum undatum, L. A few, living.

Nassa reticulata, L. Empty shells.

Ostrea edulis, L.

Chlamys (=Pecten) varius, L. Empty shells.

Mytilus edulis; L. Living, abundant.

Nucula nitida, G. B. Sby. Shells only.

Cardium edule, L. do.

C. exiguum, Mont. do.

Tapes pullastra, Mont. Three empty shells.

Spisula (=Mactra) solida, L. A few empty shells.

Scrobicularia plana, Da C. (=**piperita**, Gm.) One valve.

Mya truncata, L. A few empty shells.

Barnea (Pholas) candida. do.

PYCNOGONIDA.

***Phoxichilidium femoratum** (Rathke).

***Ammothea echinata** (Hodge). Abundant.

Nymphon rubrum, Hodge.

CRUSTACEA.

BRACHYURA.

Carcinus maenas, Penn. Shore Crab. Abundant.

Hyas araneus (L.). Spider Crab.

Eupagurus bernhardus (L.). Hermit Crab. A few.

MACRURA.

Crangon vulgaris (L.). Common Shrimp. A few

Pandalus montagui, Leach (=*annulicornis*). "The Pink Shrimp."

ISOPODA.

***Sphaeroma serratum** (Fabr.).

Idothea balthica (=*tricuspidata*).

AMPHIPODA.

***Apherusa bispinosa** (Bate).

***Dexamine spinosa** (Mont.).

***Aora typica**

***Podocerus falcatus** (Mont.).

Corophium bonnellii, M. Edw. (=*crassicorne*);

***Unciola crenatipalmata** (Bate);

Caprella linearis (L.). Abundant.

POLYZOA.

Membranipora lacroixii, Aud. On shells of mussels.

M. pilosa, L., var. *dentata*. On fronds of *Laminaria* and other large algae.

Alcyonidium gelatinosum, L. Very abundant in the Orwell near Pin Mill.

A. mytili, Dalz. A yellowish incrustation on mussel shells.

Amathia lendigera, L.

Valkeria uva, L.

CHAETOPODA.

Lepidonotus (Polynoë) squamatus, L. Fairly abundant.

Some specimens of mud-inhabiting worms have not yet been identified.

Sabella penicillus. Empty tubes.

ECHINODERMATA.

Asterias rubens, L. "Five-fingers." A few.

Solaster papposa, Fabr. "Sun-star." Common.

Echinus miliaris, L. "Purple-tipped Urchin." Taken in great quantities off Harwich.

Thyone fusus, O. F. M. One specimen. Dr. Sorby says that he dredged this once near Harwich and in the Orwell, but in each case only one specimen was taken.[3]

[3] *Victoria History of Essex*, vol. i., p. 87.

CŒLENTERATA.

HYDROZOA.

Eudendrium ramosum, L.
Halecium halecinum, L.
Sertularia pumila, L.
S. argentea, E. and Sol.
Plumularia echinulata, Lam. On fronds of *Laminaria.*
P. setacea, Ellis. On mussel shells.
Aurelia aurita, Lam. Abundant near Pin Mill, on the Orwell.

ACTINOZOA (Sea Anemones).

One small specimen of a Sea-anemone was included; but this has not yet been identified.

PORIFERA (Sponges).

Clione celata, Grant.
***Suberites** sp. ?
Halichondria panicea, Pall.
Chalina oculata, Pall.
***Halisarca** sp. ?
Grantia compressa, Auct.
Sycon ciliatum, Fabr.
***Leucosolenia complicata**, (Mont.).

MARINE ALGAE.

GREEN (*CHLOROPHYCEAE*).

Cladophora flavescens, Harv.
C. rupestris, Kütz.
Enteromorpha clathrata, J. Ag.
E. intestinalis, Link.
E. prolifera, J. Ag.
β. tubulosa, Reimb.
Ulva latissima, J. Ag.

RED (*RHODOPHYCEAE*).

Ceramium rubrum, C. Ag.
Chondrus crispus, Stackh.
Gracilaria confervoides, Grev.
Polysiphonia elongata, Grev.
P. nigrescens, Grev.
Polyides rotundus, Grev.
Rhodomela subfusca, C. Ag.

Mr. Holmes says of the Algae obtained :—" All are common species, such as are found at mouths of rivers, near the sea. The Enteromorphas are found where the water is less salt, usually where a fresh water stream runs into the salt water. *Cladophora rupestris*, *Rhodomela subfusca* and *Polyides rotundus* more frequently occur in pools by the open sea, but may have been washed ashore or torn up by the tide in sea water."

Reports of previous dredging excursions in the estuaries of the Orwell and Stour were published in the *Essex Naturalist*, vol. v. (1890), pp. 169-173, and vol. v. (1891), pp. 241-247.

ON A PREHISTORIC INTERMENT NEAR WALTON-ON-NAZE.

BY S. HAZZLEDINE WARREN, F.G.S.

[*Read January 28th* 1911.]

With Plate xiv.

THE excursion of the Essex Field Club to Walton-on-Naze on 17th September 1910, resulted indirectly in a discovery of some importance. Two members of the party, namely Mr. Miller Christy and myself, took the opportunity to stay in the neighbourhood over the week-end. On the afternoon of the day following the excursion, we together undertook a subsidiary investigation of the mud-flats bordering the estuary of the Hamford Water.

I have visited these mud-flats very frequently, and I consider it a coincidence of extraordinary good fortune, that I should have had Mr. Miller Christy for my companion on the one occasion upon which I made the most important discovery which has yet been made in that district. It was fortunate not only on account of the practical help which he gave in dealing with difficulties which I could not successfully have overcome alone, but also on account of the valuable confirmation which he is able to give in respect of the circumstances under which the discovery was made.

In previous communications to this society I have given some account of the general character and stratigraphical succession of the marsh deposits of this district.

As we proceeded along the line of outcrop of the marsh clay underlying the Buried Prehistoric Surface, as described in those papers, I noticed the ends of two bones, standing obliquely out of the clay. I at once called my friend to the spot, as the bones looked to me extremely like the distal extremities of a human tibia and fibula, side by side in their natural position. Upon probing into the clay by the side of these

bones, with the pocket fern trowel I usually carry on these expeditions, I almost at once felt the form of a skull. Although we had no other implement than the fern trowel, we at once set to work in earnest to dig away the soft buttery clay, and throw it out with our hands, until we had exposed the whole skeleton to view.

I had not taken my camera with me, but fortunately Mr. Miller Christy was able to supply this want, with a small Kodak. We were anxious to obtain photographs of the skeleton before the bones were in any way disturbed. The chief difficulty now was to deal with the water which filled the hole we had dug. We therefore parted in opposite directions, going in search of old tin cans, to serve to bail out the water. It seemed that never before had a sea beach been so free from these usually super-abundant additions, now so much to be desired! At length I succeeded in finding a small much damaged tin, while a hail from my companion announced the discovery of a veritable prize. I also found the wicker-work lid of a hamper, which very materially assisted in carrying away the smaller bones.

Even then our difficulties were not at an end. It was not possible to thoroughly bail out the water without disturbing the position of the bones. My fellow worker suggested digging another hole beside the original one, into which the water might drain. Although it was now getting late, and the light was fading fast, we succeeded in getting this done in time to take several photographs, which turned out more successfully than we anticipated, considering the unfavourable conditions under which they were taken.

The bones were of the same colour as the clay in which they were embedded, and so presented difficulties from the point of view of photographic contrast. We accordingly took some hand-bills of the Walton steam-boat excursions, a bundle of which we found conveniently on the beach, and placed them behind the bones in order to throw them into relief. This may not have been commendable from an artistic point of view, but it has made the skeleton visible on the photographs, which would scarcely have been the case without some such device.

We had to deal with this discovery somewhat hurriedly. We should have liked much more time at our disposal. But unfortunately we were both obliged to return to London on the next day, and it was certainly advisable to deal with it at the moment, in the best way we could, rather than leave it for any considerable time, partially exposed on a site swept twice a day by the open sea.

The interment was at a depth of about ten feet below the present salting surface. It had only just been exposed by the erosion of sea, at the foot of the low cliff which is formed of tidal silt. The grave was originally dug to a depth of about two feet six inches from the line of the Buried Prehistoric Surface, which was the natural surface of the ground at the time the grave was made. The skull, and many of the other bones of the skeleton, are covered with a network of markings caused by the rootlets of plants. The marsh clay in which the interment was found is

traversed by rootlets, now much decayed. These belong to the plants which grew upon the Buried Prehistoric Surface. They do not belong to plants which grow upon the present salting surface above. It was clearly these rootlets which caused the network of markings upon the bones.[1] As these rootlets had penetrated to the interment and worked their way round the bones during the life of the plants to which they belonged, the interment must

FIG. I.—PREHISTORIC INTERMENT NEAR WALTON-ON-NAZE. FROM A PHOTOGRAPH BY MR. MILLER CHRISTY TAKEN AS SOON AS THE SOIL HAD BEEN REMOVED AND BEFORE THE BONES HAD BEEN DISTURBED.

have been made some little time, at least, before the submergence of the ancient surface. For it is perfectly certain that the plants could not have lived upon this surface after the submergence had taken place.

The interment was of the contracted type, presenting one unusual feature, and the grave was only just large enough to

1 The question of the network of black markings upon the bones gave rise to considerable discussion after the reading of the paper. My theory of their origin was called in question by several of the speakers. I have since found a skull of *Bos longifrons* in the Alluvium of the Lea Valley presenting some markings of the same character. Upon carefully washing away the adherent material, I found decayed rootlets lying in contact with the bone along the lines of the black markings. I think this goes far to confirm the correctness of the interpretation given in the text.

accommodate the body. The grave was very carefully and smoothly finished, and so shaped that the head was resting in a very comfortable looking position, slightly raised above the body. The body was placed with the head pointing towards the north, and the face to the east. It was lying on its left side, the hands were drawn up in front of the face, the right leg was folded in the usual position, but the left leg was kept straight out; it was brought straight upwards so that the left foot was in front of, and close to, the face, although at a higher level in the grave.

The body had been wrapped round with the tough roots of the sand-grass, which may easily be obtained in strong cords many feet in length. Mr. Miller Christy has suggested to me that this was probably used as a binding to keep the body in its contracted position.

I have submitted samples of this decayed grass which was found covering the bones, to Dr. A. B. Rendle, Keeper of Botany in the Natural History Museum. He kindly undertook its examination, but did not find it possible to determine the species with precision. It was very probably the common twitch, but it might be the marram-grass or some nearly allied species. It was certainly one of this group. Among the washings of the bones, I obtained some seeds which Mr. Clement Reid pronounced to belong to one of the larger grasses, but they were not sufficiently well preserved for determination.

Before removing the vertebræ from their position in the grave, I noticed that there was a considerable quantity of gritty substance occupying the position of the viscera. This proved to be composed of seeds, which were undoubtedly the remains of food which the man had eaten. Mr. Clement Reid kindly undertook to examine these, and reports that the majority of them belong to the Blackberry, together with a smaller number of Rose and *Atriplex*. Mr. Reid observes that the precise form of rose to which the seeds may belong is uncertain, but that this is neither the *Rosa arvensis*, nor the *R. spinosissima*, although either of these might be expected to occur. Both the blackberry and the rose were undoubtedly eaten.

With regard to the *Atriplex* seeds, these are quite as abundant as those of the rose, and from the special circumstances of their discovery inside the body of the man, it seems to me that they

may have been eaten with the rest. It is perhaps worthy of remark, that the *Atriplex* is an edible plant, and one which was formerly more largely eaten than it is to-day. One species of the genus, in fact, is still cultivated as a garden vegetable in France.[2]

I think there must have been at least a pint, if not more, of these seeds. This represents a very much larger volume of berries, and I wondered if the man might have died from the effects of dining well, rather than wisely, upon the enticing fruit. Dr. Keith, however, does not support this view.

No archæological relics were found in the grave. This is unfortunate, but is no unusual thing in the case of prehistoric interments.

Immediately over the site of the grave, and for a radius of several yards around it, the ancient surface was occupied by a considerable accumulation of prehistoric débris. This consisted of worked flints, some very rude, although small, while others were more finely worked, together with broken pottery, lumps of burnt clay of from three-quarters of an inch to two inches in diameter, and much charcoal disseminated through the mass in small fragments.

It is possible that the apparent association of the interment with this débris which overlies it in the ancient prehistoric surface, may be purely accidental. At the same time, the balance of the probabilities seems to me against such a view. I think that it is more reasonable to assume that the two are, in all probability, directly associated together.

This consideration receives support from the fact that, at a spot some few miles from the interment, I found another accumulation upon the Buried Prehistoric Surface composed of precisely the same association of débris—namely, charcoal, lumps of burnt clay, pottery and worked flints of the same types. Now at a spot a little below the outcrop of this bed of débris as seen on the slope of the shore, I found what I have little hesitation in believing to be an interment by cremation. I saw what

2 The seeds may have been eaten accidentally with the leaves, or intentionally. Mr. W. Cole points out to me that the flowers, seeds, etc., of many plants are both more nutritious and more palatable than the leaves. He thinks this may possibly be the case with *Atriplex*. [In an article on plant products used for food and medicine among the Gosiute Indians, inhabiting the desert region lying to the south west of the Great Salt Lake in the State of Utah, by Mr. R. V. Chamberlin in the February part of the *Proceedings of the Academy of Natural Sciences of Philadelphia* (quoted in *Nature*, 18th May, 1911, p. 390), it is stated . . . "Seeds are gathered from *Salicornia herbacea*, species of *Atriplex* and *Chenopodium*, *Sisymbrium canescens*, various composites, *Triglochin martimum*, and *Typha latifolia* . . . ." All these plants, excepting *S. canescens*, are common on the Essex coast.—Ed.]

I at first took to be the lower part of a large vessel of prehistoric pottery, from which all the upper part had been broken away. As I began to dig round it, I found that it was only a sham urn, if one may so describe it, composed of broken pieces built up into the shape of a whole vessel. The large piece which did service for the bottom of the " sham urn " actually consisted of a piece of the side of a large vessel, still retaining part of the original rim. It certainly had not been disturbed since prehistoric times. Inside this " sham urn " were numerous calcined flints, and other evidences of fire. Although I could not trace any bone, I feel little doubt that it was actually a burial by cremation, from which the remains of the bone had disappeared. As already stated, this " sham urn " was found below the outcrop of the bed of prehistoric débris, as seen on the slope of the beach. The distance between them was only a few yards, and I feel no doubt in my own mind that the bed of débris formerly extended over it, until removed by the erosion of the sea.

Thus it seems that we may reasonably suppose that this special association of prehistoric débris is, or at least in some circumstances may be, directly connected with interments. When we come to the further point of considering what the value of this relationship may be, we reach ground of a more debatable and speculative nature.

The abundance of charcoal is somewhat suggestive of a funeral pyre having been lighted over the grave. Certain peculiarities in the worked flints, however, particularly the abundance of diminutive side-scrapers, seem rather to indicate that some special industry had been carried on upon the spot.

If one may venture to throw out a suggestion, it seems to me not improbable that the man whose skeleton we found was a craftsman in some special industry. That he carried this industry on at his own hut, so that the surface surrounding his abode became strewn with the débris of his craft. And further, that when he died, he was buried, after the manner of a custom which is found among modern savages, in his own dwelling, and consequently under the débris of his own industry.

I do not wish it to be thought that I attach too much weight to these suggestions. Perhaps it is somewhat premature to indulge in speculation of any sort. One can only hope that future discoveries will throw further light upon the problem.

Dr. Keith, who has kindly undertaken the task of examining the bones, has come to the conclusion that the man was a worker in some special trade involving a peculiar twist of the right arm. He throws out the suggestion that the man may possibly have been a weaver.

In speculating upon the trade that this man may have followed, it seems to me quite worth while to bear in mind the idea that the relics found overlying the grave may possibly be the waste product of the actual craft that he followed.

As implied in the foregoing account of the circumstances of its discovery, the skeleton belongs undoubtedly to the age of the Buried Prehistoric Surface. The question of the archæological stage to which this surface should be referred, is a somewhat wide and complicated problem. This is discussed at some length in my paper on "The Correlation of the Prehistoric Floor at Hull Bridge with similar beds elsewhere," published in the present part of this journal. As that paper was in some measure introductory to the present one, it is not desirable to repeat the details of the evidence here. Suffice it to say that this evidence seems to me to point to the conclusion that the remains on the ancient buried surface date from an early part of the Bronze Age, as usually understood in this country. Upon the continent of Europe, where the epoch of Robenhausen is taken as typical of the Neolithic Age, in spite of the fact that bronze of local manufacture was undoubtedly in use, it would probably come within the limits of that stage. That is to say, using the Sequence Date scale, its age lies between s.d. [9] 50 and s.d. [9] 60, probably about s.d. 58, or slightly earlier.

PRELIMINARY REPORT ON THE SKELETON BY PROFESSOR A. KEITH, M.D., F.R.C.S., CONSERAVTOR OF THE MUSEUM OF THE ROYAL COLLEGE OF SURGEONS.

From a preliminary examination of the bones of the skeleton, Professor Keith writes to me as follows :—

"The particular value of the prehistoric skeleton you have had the good fortune to discover at Stone Point, Walton-on-Naze, lies in the fact, firstly, that it is perhaps the most complete prehistoric skeleton ever discovered, and secondly, that the data

relating to its antiquity have been observed and gathered with accuracy.

"When you first showed me the delicately moulded and rather diminutive skull I gave it as my opinion that it must be that of a woman; but as you pointed out, the pelvis left no doubt as to the sex: it is that of a man. My preliminary mistake emphasises the character of the whole body—it is finely moulded, slender, feminine in type.[3]

"By actual measurement I estimate the height to be 1592 mm. (5 feet $2\frac{3}{4}$ inches), and by comparison with skeletons in the Museum there can be little doubt that the estimate is accurate.

"He was a young man: the wisdom teeth are just coming into use, and the last epiphyseal lines of the long bones closing, so we may regard him as about 23 or 24. He was a rather slender and dapper young man, but finely formed, straight, and well proportioned. His legs are straight and symmetrical, and bear a normal proportion to arms, trunk, and head. There is no abnormal or pathological condition of the left knee, to account for its straight position in the grave. He is just a little fellow, such as one may see busy in the offices of the city to-day.

"The forehead is well proportioned and rather high. The brain also is well proportioned, although small: its volume being only 1260 cubic centimetres, the normal being about 1540 c.c. Still, in proportion to the body, it is not so abnormally small, and certainly because it is small must not be adjudged primitive.

"The shape of the head is that which we associate with typical modern English youths at our universities and schools: prominent occiput, and slender neck. Its maximum length is 173·5 mm., its maximum breadth 137 mm., its height measured from the meatus of the ear 116 mm. All these measurements are about 10 to 15 mm. below the modern average. The breadth is 78·9 per cent. of the length [the cephalic index]; the height 67 per cent. of the length. The skull therefore inclines towards the short-headed form. All these proportions are very common to-day. (*Plate xiv.*)

3 As this paper was passing through the press, Dr. Keith writes to say that the question of the sex of the skeleton presents some difficulties. From a more thorough examination of the bones he finds that everything but the pelvis is so distinctively feminine in form that he is now inclined to think that it must be a case of a woman with a contracted pelvis, and not a man.

"The features are altogether modern: the nose is prominent and narrow, it has a high bridge, and a suspicion of the Roman in its curve. The supra-orbital ridges are scarcely marked. The jaws and teeth are regular; the chin is not markedly prominent. The face is long and narrow, and of the oval type; the cheek bones not being high nor projecting.

"It is when the teeth and jaws are examined that we see that we cannot be dealing with a modern Englishman. At the present day the lower incisors are brought up behind the upper ones in the action of mastication: there is very little side to side movement of the lower jaw. But in this man and in the English people of prehistoric times the incisor teeth were brought edge

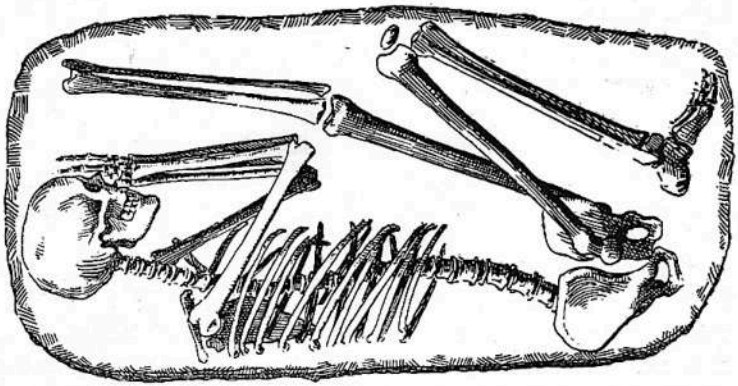


FIG. 2.—DIAGRAM SHOWING THE APPROXIMATE POSITION OF THE SKELETON IN THE GRAVE. (FROM A SKETCH MADE ON THE SPOT.)

to edge. They were rubbed against each other from side to side during mastication, so that the crowns became worn down with use. When this change in mastication came about in England, we do not know, but it would be interesting to find out.

"Your evidence points to a death in the autumn, and also gives us a clue to the nature of the food. The amount of the seeds found within the body would hardly be an excessive one, or likely to have caused death. It needs a lot of haws and blackberries to keep even a little man going for 24 hours. The cause of death one cannot discover: the skeleton is healthy, and shows no evidence of violence.

"Another interesting point is the marked specialization of

the right shoulder and arm. He was undoubtedly right-handed. I have never seen such a specialization of the right shoulder joint. Whatever trade he followed was one which entailed a constant rotation at the right shoulder, a twisting out of the whole arm such as one employs in using a cork-screw, or a cobbler stitching. Could he have been a weaver? At least he looks more like a weaver than a burly soldier. I find that a specialization of the bones of the right arm is frequently seen in prehistoric skeletons.

"His hands and feet are small, his fit in gloves would be about $5\frac{3}{4}$, ladies' size. In hats a No. 5 would suit his small but well-formed head.

"The skeleton deserves a fuller description. I hope you will join with me in preserving him in the records of the Royal Anthropological Institute at some future date. I might then enter into his relationship with other prehistoric finds.

"I agree with you that the bones are passing into an earthy or semi-fossilized state."

NOTE ON THE METHOD ADOPTED FOR THE PRESERVATION OF THE BONES.

When the skeleton was found the bones were saturated with salt water. The first process necessary was to soak them in changes of fresh water to remove the salt, and thus prevent future trouble from its efflorescence. Unfortunately the softer parts of the bones proved to be in a much more advanced state of decay than at first appeared. After the soaking had proceeded for two days, all the softer parts of the bones were found to be in an extremely soft and spongy state, and they threatened to crumble away to a very serious degree. I had intended to continue the soaking longer than this, to ensure removal of the salt, but as they were giving way so much it seemed the lesser risk to allow them to dry slowly, and then harden them as quickly as possible. In view of the possibility of future trouble from the efflorescence of salt, should this not have been thoroughly removed, I thought it better to use Browning's Preservative Solution (which is sold by the Indestructible Paint Company) rather than gelatin. This is used cold, after the specimens have become dry. It is a very thin fluid, is readily absorbed into the substance of the object, and unlike gelatin it is, I believe, quite unaffected by water. So far as one can judge at present, the result has been everything that could be desired. The preservative solution has apparently restored the remains almost to the toughness of fresh bone. It was not, however, sufficiently filling for the bad places in the softer parts of the bones, where they had already begun to break away. For this some weak glue was used.

Some of the limb bones have thin superficial mineral incrustations upon them, which look as if they were of a pyritous nature. While this is to a certain degree useful in giving an additional proof of the genuine

antiquity of the skeleton, there is some risk that it may give trouble in the near future. It is to be hoped that, if it be iron pyrites, it has not penetrated far into the interior of the bone.

The relics from the Buried Prehistoric Surface are occasionally impregnated with this troublesome mineral. I have had fragments of prehistoric pottery which have been damaged by its decomposition, accompanied by the peculiar acid smell which is only too well known to every collector of fossils.

My thanks are due to Mr. Miller Christy for his assistance in the first part of the work, to Mr. Clement Reid, F.R.S., Dr. A. B. Rendle, and Dr. A. Keith. I append a preliminary report on the anatomical features of the skeleton by Dr. A. Keith, and also a note on the treatment which I gave to the bones for their preservation.

[After the reading of the paper, Mr. Miller Christy stated that as he assisted at the unearthing of the skeleton, he was in a position to confirm the account which had been given. The speaker referred to the fact of the greater number of the bones of the skeleton having been found, with the exception of those of the left foot, which had entirely disappeared. Even some of the small bones of the ear [the malleus and the incus] had been recovered from the washings. Considerable difficulties were encountered in carrying out the work, particularly the fading of the evening light and the rapid rising of the tide which almost threatened to overwhelm the site before the work could be completed. These difficulties necessitated the greatest possible expedition.

He had himself found flakes and scrapers of flint, fragments of primitive pottery, and débris of charcoal, *in situ* in the section of the ancient surface which was exposed a few feet above the position of the skeleton. The speaker also dwelt upon the fact of the body having been apparently bound round by the tough roots of the sand-grass, which may readily be obtained in long cords many feet in length. The straight position of the left leg was a remarkable feature of the interment. It was a puzzle of which no explanation had yet been forthcoming.]

DESCRIPTION OF PLATE XIV.

Photographic views of the skull in five different positions. The scale is about $\frac{1}{3}$ natural size, in each instance, on the plane that is nearest to the camera, but becomes less (owing to photographic perspective) on the planes that are further away. The photographs are not intended to be used as the basis of measurements.

NOTES ON ALIEN AND CASUAL PLANTS IN THE NEIGHBOURHOOD OF WALTHAMSTOW AND WOODFORD, ESSEX.

By C. NICHOLSON.

[*Read 29th October* 1910].

A REMARK to the effect that I was interesting myself in the "Alien" plants of Essex is responsible for my reading the following local notes on a subject in which comparatively little seems to have been published in a convenient form. We have, of course, that excellent classic, Gibson's *Flora of Essex*, in which the question of alien and casual plants is hinted at more or less broadly by its shrewd author, but I believe I am right in saying that no list of such plants recorded for the county has been compiled. It seems to me, therefore, desirable that the Club should take the matter in hand, and publish such a list in its journal which would not only direct fresh attention to the subject, but also serve as a working list for students, fresh records and notes being published from time to time. I may say that, as I have a fair amount of material in hand for such a list, I should be glad to put it at the disposal of the compiler. But, in the meantime, I shall be pleased to receive notes of any unusual plants which have been found, or may yet be found, in any part of Essex, particularly the S.E. Lists of such plants from any district will be especially welcome. All records should include, as far as possible, name of plant, locality, date when found, whether common or only a single specimen, and any other notes thought to be of value.

In sending me an interesting list, Mr. Shenstone asks the very pertinent questions, "What is a casual?" "When does a stray plant from a garden begin to be a casual?" and "When does it cease to be a casual and become an established plant?" This matter of definition of terms is very important, but there seems to be a good deal of uncertainty, or difference of opinion, on the subject, and I shall therefore quote the definitions given by H. C. Watson in his *Cybele Britannica*, which seem to be the most generally accepted. They are as follows:

Native. Apparently an aboriginal British species, there being little or no reason for supposing it to have been introduced by human agency.

Denizen. A species at present maintaining its habitats, as if a native, without the aid of man, yet liable to some suspicion of having been originally introduced ; e.g., *Impatiens noli-tangere.*

Colonist. A weed of cultivated land or the vicinity of houses and seldom found except where the ground has been adapted for its production by the operations of man, with some tendency to appear also on shores, landslips, etc.; e.g., *Lychnis githago, Papaver* and *Adonis annua.*

Alien. A species now more or less established, but either presumed or certainly known to have been originally introduced by human agency ; e.g., *Mimulus langsdorffii, Camelina sativa, Hesperis matronalis.*

It will be observed that all these definitions deal with established species and that I have not quoted a definition of the term " Casual." So far as I can gather, Watson uses this term in practically the same sense as " Colonist." There is no term to designate such plants as are accidentally introduced into a district as escapes from cultivation, or otherwise, and of a fugitive nature and not persisting, and it seems to me that the term " Casual " might be very aptly applied to such species, which are mostly annual or biennial and of which the Evening Primrose is a type. It is at once obvious that, with the exception of the first, all these definitions apply to plants which have been either probably or certainly introduced by human agency, the difference between them being only in degree, not in kind, and it is the very existence of these degrees that constitutes the difficulty in determining the status of a given plant. Suffice it to say, however, that, broadly speaking, a plant which, while not actually cultivated by man, clings to him and his works, so to speak, or, in other words, is rarely found growing spontaneously (*i.e.* wild) anywhere but on or near cultivated land or in the immediate vicinity of houses, is to be suspected as of alien origin. At the same time it is to be borne in mind that a plant known to be of alien origin, may be found growing in this country apparently wild, and in a perfectly natural and suitable habitat, while, on the other hand, another species growing under similar conditions, but in an unsuitable habitat, judging from its geographical range in other countries and the kinds of locality in which it is there found, would be presumed to be of alien origin, although it might be impossible to discover the means by which

it was introduced. Mr. Shenstone's first question, "What is a casual?" I have already answered, and the others are easily dealt with. All the plants that are positively known, or strongly suspected, to have been introduced into an unnatural locality by human agency may be classed as casuals, and once a casual, always a casual, whether established or not. I need not enumerate the multitude of methods by which plants in general are disseminated, but it will be necessary to mention some of the ways in which alien and casual plants may be introduced. Of these probably the most effective are: (1) the importation of the seeds with all kinds of cereal and other farm seeds, which are usually sifted before being used in this country and the siftings thrown out, the numerous foreign seeds amongst these germinating; (2) the introduction of ballast from other countries, which being dumped at our ports often remains long enough to allow seeds brought in with it to germinate, if the weather be suitable; (3) the carriage of this ballast to the various parts of the country by rail and the consequent direct distribution of the contained seeds. Minor causes of dispersal are: (4) the importation of wool, hides, and other merchandise to which adhesive fruits and seeds of many kinds stick and are removed on their arrival in this country; (5) the considerable use of certain foreign seeds for cage birds, the seeds being thrown out with the sand when the cages are cleaned out and so perhaps become established in gardens from which they may spread to surrounding waste land and so get distributed; (6) the gardens, nurseries, game coverts, and other places where exotic trees and plants are cultivated, constitute sources of alien supply for the surrounding districts; (7) the deposition of refuse outside towns by the local authorities; (8) the importation of hay and other forage and plants for agricultural use, is another source of aliens, though a small one.

In his *List of British Plants*, which comprises the Phanerogams and Pteridophyta, G. C. Druce includes about 1,100 aliens and casuals, of which I have notes of nearly 200 for Essex. On studying Druce's list I find that of the great Orders (*i.e.* those containing 50 or more species) the *Leguminosæ* rank highest with 67 per cent. of aliens and casuals, the *Boraginaceæ* next with 64 per cent., and then the *Cruciferæ* with 63 per cent.; next the *Graminaceæ* with 48 per cent., *Lamiaceæ* and *Asteraceæ*

with 46 per cent. each, *Ranunculaceae* with 44 per cent., *Umbelliferæ* 41 per cent., *Chenopodiaceæ* with 40 per cent., *Scrophulariaceæ* with 36 per cent, *Caryophyllaceæ* 35 per cent., *Rosaceæ* 19 per cent., and the *Cyperaceæ* with one out of 105 species, which is less than one per cent. It is easy to understand why the *Leguminosæ* and *Cruciferæ* should be so well represented, so many of them being of economic value, or associated with crops, but one would scarcely have expected the *Boraginaceæ* to rank so highly. On the other hand one would have thought that the grasses as fodder crops and *Asteraceæ* with their flying seeds would have shown a greater percentage of foreign introductions. The records for Essex do not work out to anything like the same proportions, probably because they are, at present, by no means complete.

When a piece of land is cleared and cut up for building purposes, the removal of turf, digging of foundations, excavations for sewers, and other processes, necessarily cause a great disturbance of the surface soil, and what is not immediately built on forms a fine nursery for the straying seeds of innumerable plants, which readily germinate and grow in bare soil without much regard to its composition and texture.

Were the operations to stop here the ground would soon be covered with a selection of the most enterprising species already established in the neighbourhood, with, perhaps, a few whose seeds had lain for years dormant in the soil, awaiting such a disturbance to enable them to germinate. But in addition to these preparatory stirrings there is imported into the district a quantity of shingle, gravel, ballast and other material for the make-up of the roads and other purposes, and since this will probably come partly from other districts and partly from other countries, numerous plants strange to the neighbourhood are almost certain to spring up. From these considerations it is scarcely necessary to say that building estates are on the whole the most fruitful areas in alien and casual plants, but land which has been laid waste in any way will generally repay the seeker after such strays.

I will now proceed to what most of you no doubt will consider the more interesting part of my paper and give the results of my own explorations in Hale End and Woodford, where much spasmodic building goes on.

In this neighbourhood a building estate is generally a piece of land on whichone or more roadways are marked out, kerbed, ballasted with coarse shingle and then left to Nature's tender mercies, a house or two being often put up here and there just to show what is intended! The coarse shingle gradually gets covered with a variety of plants, of which the common buttercups, clovers, dandelions, plantains, hawkweeds, docks, goosefoots, grasses, shepherd's purse, groundsel, and knot-grass furnish by far the greater part, the seeds being, no doubt, mostly supplied from local stock, but a fair proportion probably come with the shingle, and amongst these are sometimes those of aliens or casuals, which may not appear until a year or two after their arrival, when some chance disturbance of the stones gives them an opportunity to germinate. I should like to say here that I wish to claim your indulgence for an incidental reference now and then to interesting points in connection with plants which are not aliens or casuals, and therefore, strictly speaking, should not be mentioned at all.

On building sites in Hale End, I have met with Viper's Bugloss (*Echium vulgare*), Small-flowered Willow Herb (*Epilobium parviflorum*), (*Lepidium ruderale*) Narrow-leaved Pepperwort, all casuals; also the denizen, Common Melilot (*Melilotus officinalis*), and the colonist, Treacle-mustard (*Erysimum cheiranthoides*); the last named only a few inches in height when growing on the stony roadway, but reaching to its normal height of about two feet on another estate where it grew on the clay. According toBabington, this species is wild in the fens. I have also found theRosebay (*Epilobium angustifolium*) and Great Willow Herb (*E. hirsutum*) in similar situations not exceeding 18 inches in height, but both occur of the normal stature of 4ft. or 5 ft. in suitable spots elsewhere in the district. These would therefore be "casual" on the dry stony ground and "native" in damp spots. The aliens, *Salvia verticillata* and Canadian Fleabane (*Erigeron canadensis*) have also occurred; the former, being a perennial, persists from year to year, but seems gradually dwindling.

A heap of builder's rubbish, mainly consisting of mortar refuse, cement, dust, bricks, and slabs of concrete, gradually became overgrown with grass and weeds, among which appeared a patch of the alien, *Lepidium draba*, and one specimen each of

the casuals, White or Evening Campion (*Lychnis alba*), Bladder Campion (*Silene cucubalus*), and the apricot-scented Night-flowering Catch-fly (*S. noctiflora*). On another estate, from which the turf had been removed, leaving the clay exposed, the most noteworthy plant found was the alien, *Melilotus indica*, a native of warm countries. The colonist, Lesser Wart-cress (*Coronopus didymus*) and its commoner relative, Greater Wart-cress (*C. ruellii*), were also observed, as well as Many-seeded Goosefoot (*Chenopodium polyspermum*), which turns up in some plenty hereabout on newly-disturbed wastes.

I have once met with the colonists, Corn Crowfoot (*Ranunculus arvensis*) and Penny Cress (*Thlaspi arvense*) in a cornfield at Hale End, and on the railway bank the denizen, Sand rocket (*Diplotaxis muralis v. babingtonii*), the casuals, Mountain Crane's bill (*Geranium pyrenaicum*) and Wild Carrot (*Daucus carota*) and also *Galium erectum* and the Acrid Lettuce (*Lactuca virosa*), which I think must be considered casuals as they occur nowhere else in the district, so far as I know. All except the last are well established.

In my garden the alien, *Alkanna lutea*, a yellow flowered South European Borage wort, and the casual, Hare's Ear (*Bupleurum rotundifolium*) have occurred, which I cannot at all account for, but the latter has turned up at Chingford for several years in at least one spot. Henbit Deadnettle (*Lamium amplexicaule*) has also been recorded from Hale End, where it appears to be a casual, as it is of rare occurrence, and the colonist, Green Millet (*Setaria viridis*) has appeared at Walthamstow.

Passing on now to the Woodford Green district, mention may be made first of *Impatiens parviflora*, a small-flowered balsam native in mountain woods in Siberia, a specimen of which was found in 1906. In 1907 the species was better represented, there being about a dozen plants, and it is still spreading. On the Monkhams estate, recently cut up and partly built on, the casual, Stinking Groundsel (*Senecio viscosus*), the aliens, *Galinsoga parviflora* and White Melilot (*M. alba*), with the casuals, Common Flax (*Linum usitatissimum*), Field Woodruff (*Asperula arvensis*) and *Sisymbrium pannonicum*, turned up on the newly-made roadways, whilst on the adjoining field, from which the turf had been removed partly, several plants of the colonist, Purple Cow Wheat (*Melampyrum arvense*) showed up conspicuously

in the sunshine amongst a medley of small plants, with the casual, *Crupina vulgaris*, which looks like a cross between a Catchfly and a Knapweed, and *Vicia pannonica* var. *striata*, a vetch with remarkably hairy, stout and short pods. But, so far, the best locality about here has proved to be an estate near Woodford Wells, to which I paid a passing visit in the early autumn of 1905, and quickly recognised it as a very paradise for the botanist, being not only a "casual" ward, but a dumping ground for "aliens" into the bargain. There is only one road on this estate, one end of which was apparently a small orchard. Here I found on one side of the made roadway, and bordering it, a belt of lime-covered soil, on which was growing a perfect forest of Upright Goosefoot (*Chenopodium urbicum*) with a few examples of the alien, Gold-of-Pleasure (*Camelina fœtida*), and some climbing Buckwheat (*Polygonum convolvulus*), a casual, interspersed. Further along, in a small belt of trees, were a good many low bushy plants of Black Nightshade (*Solanum nigrum*). On the other side of the road was a mixed growth, amongst which the colonist, Corn Cockle (*Lychnis githago*) predominated; one or two Blue-Bottles (*Centaurea cyanus*), a plant of Corn Spurrey (*Spergula arvensis*), Buckwheat (*Fagopyrum esculentum*), all of which are casuals, and one specimen of *Blitum capitatum*, an alien species, were also observed. The last named is remarkable, and perhaps unique, as being of unknown origin, its native country not having yet been ascertained, I understand. There was also the branched upright-growing form of Knotgrass (*Polygonum aviculare*), some 18 inches or more in height, and a little further along was a large patch of Marsh Cudweed (*Gnaphalium uliginosum*), some of the plants being large and very spreading. Beyond this again was a regular jungle, the bulk of which consisted of common and Pale-flowered Persicarias (*P. persicaria* and *P. lapathifolium*), Docks, Knotgrass, White Goosefoot and Spear Plume-Thistles (*Cnicus lanceolatus*).

Amongst these, however, were noticed the following casuals: Common and Common Red Hemp-nettles (*Galeopsis tetrahit* and *G. angustifolia*) and Bladder, Night-flowering and White Campions; also the alien, Pale Yellow Woundwort (*Stachys annua*), the casual, Grey Madwort (*Alyssum incanum*), each represented by several specimens, and one plant of Ox-eye

Chamomile (*Anthemis tinctoria*). There were many Evening Primroses, too, and one Great Snapdragon (*Antirrhinum majus*), which may have come as seeds from neighbouring gardens, but, from their positions, I am inclined to think not. By no means the least interesting feature of this "paradise" was the extraordinary way in which certain species were grouped in separate patches.

It will be noticed that a fair proportion of the species enumerated are more or less common in the eastern counties, and I think it may be safely assumed that the seeds from which they sprang came with the sand, shingle, and other materials, and that these were brought from one or another of those counties by the Great Eastern Railway, which serves the whole district.

A most astonishing fact has yet to be told. When I paid an expectant visit to the estate in 1906, not a vestige of the unusual plants was to be seen. The "jungle," corncockles, cudweed and belt of goosefoot had absolutely vanished, and their places were occupied by grass, a few common small weeds, docks, and thistles. Why this should be I am at a loss to understand, but conjecture that, in the interval between the dying-down of the plants and the time when the seeds they had dropped should have germinated, the grass and local weeds spread over the whole available surface, preventing such germination or smothering any growths which may have been able to start.

MUSEUM NOTES No. VI.

X. THE GENERAL REFERENCE HERBARIUM.

ABOUT the middle of the summer of 1910 our Member, the Rev. A. C. Morris, B.A., most kindly undertook with Mr. Whitehead's assistance, the collation and arrangement of the collections of Flowering Plants and Ferns in the Museum. This work was steadily carried on from week to week, and is now fairly finished, so far as museum work can ever be deemed to be "finished." Mr. Morris has drawn up the following notes which will be very useful for those consulting the Herbarium. The principal collections incorporated are the following:—

Shenstone Collection. Presented by Mr. J. C. Shenstone, F.L.S. (*See* ESSEX NATURALIST vol. xi., 223).

Powell Collection. Purchased from the representatives of the late J. T. Powell.

Sewell Collection. Presented by the representatives of the late Mr. S. A. Sewell.

Benson Collection. Collected by the late Rev. T. Benson. Presented by Mrs. Sidney Thorp. (*See* ESSEX NATURALIST vol. I. pp. 138–9 and 205).

Moore Collection. Presented by Mr. W. Moore. Specimens collected principally within a five mile radius of Felstead Church and a four mile radius of Rochester Castle.

Plants collected by John Ray, of Epping; *See* ESSEX NATURALIST xi., 224.

Mrs. Cowles, Stratford. Plants collected near Edinburgh.

Collection of British Ferns. Presented by Miss Marian S. Ridley.

Collection of Phanerogamus Plants made by Miss M. I. Tindal (1835).

Small Collection of Teratological Specimens, made by the late Charles Browne, M.A.

And many small collections of plants by various donors.

In dealing with the mass of material that was to hand, the primary consideration that guided those responsible for the arrangement of the collection was to make the Herbarium such that it would be possible for the student as rapidly as possible to refer to any specimen therein contained. As, however, the material to hand represented collections from various sources, the first practical step to be taken was to clearly mark each specimen sheet with the name of the source from which it was derived. The next consideration was the question of what arrangement of Orders, Genera and Species should be followed. The best seemed to be that of the British Museum *List of Seed-plants and Ferns* (of 1907), for the reason that this may be used in conjunction with the fullest and latest Botany Manual, that of the ninth edition of "Babington" as revised by Henry and James Groves and published in 1904. The British Museum *List* invariably adopts or refers to the specific names of this manual.

In the work of sorting the material into the various Genera and Species four points had to be dealt with. (1) Many specimens were present which are not included in the British Museum List: aliens and such like plants. These for the time being have been placed in a special box which will later receive attention. (2) Many specimen sheets were found on which were mounted more than one species; these again have been separated, and will later be remounted and placed in the

Herbarium. They have been, however, gone through and record taken of the species represented. (3) The third point was the definite sifting of varietal names with a view to the final inclusion of the specimen under the specific name of the British Museum *List*. This was the least mechanical and therefore the most interesting work. (4) The fourth point was the important question whether or not the specimens, mounted as they were on paper of varying size and thickness, should for uniformity's sake be remounted. This task seemed not only too big, but also unnecessary, and indeed undesirable in view of the fact that in the future there will doubtless be a constant supply of fresh material to be dealt with, and but little time at the disposal of the authorities in which to deal with it. The plan adopted therefore was to have enfolding species covers of a paper much lighter in weight than the enfolding genus covers, and somewhat smaller in size, but sufficiently large and accurately enfold the larger specimen sheets that were to be dealt with. In the case of certain species, *e.g.*, the many species of the Genus *Ranunculus*, the species in the British Museum *List* are for reference sake numbered. This plan also was adopted.

The number of species included in the British Museum *List* is 1,577, of which there are absent from the Herbarium of the Essex Field Club 241 species. Out of 529 genera only 25 are not represented at all. The possession of more than 1,300 species places the Herbarium already in the front rank of county Herbaria, and to perfect the work is a task that will do credit to the present generation of workers.

A word of explanation as to how the Herbarium may be consulted is perhaps not out of place. A student wishing to refer, say, to the genus *Senecio* will refer to the British Museum List. In the index at the end of this he will find that *Senecio* is to be found on page 16. Referring to page 16, he will find that this is "Genus 225," and an ink note will direct him to the number of the cabinet in which this genus is to be found. Having the Genus-cover open before him, he will there find on the inside of the Genus-cover the species numbered (there being in this genus a sufficient number to warrant this). In removing the enfolding Species-covers to reach the one he seeks, they may perhaps, without hurt, be

turned over as the leaves of a book, but in handling the species-papers on which the specimens are mounted, they should be lifted up (using both hands), and carefully placed one on the top of the other and then replaced in their proper order. The immediate work that remains to be done is the publication of a list, using the nomenclature of the British Museum *List*, of the species that are not yet in the Herbarium. The work already done will possibly give the necessary impetus to the collecting of specimens to fill up the omissions ; partly by original field work, partly by the medium of exchange clubs and possibly by purchase. A work in which all can help.

The Herbarium is contained in Cabinets constructed on the British Museum principle, which at present number twelve ; these will, of course, be added to as necessity arises.

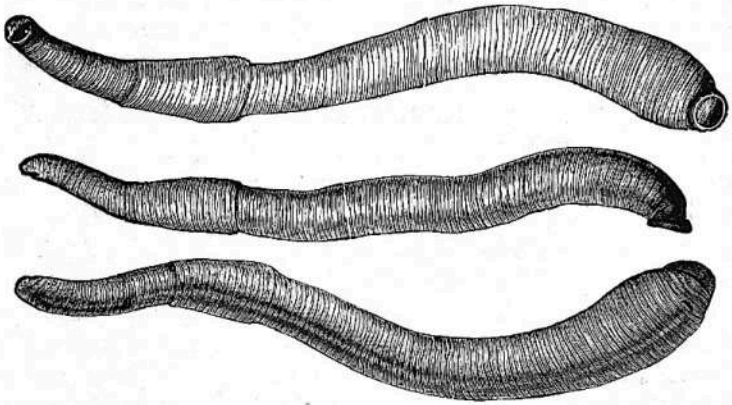
DUTROCHET'S LAND LEECH (TROCHETA SUBVIRIDIS) IN ESSEX.

By HENRY WHITEHEAD, B.Sc.

MR. J. Bostock and I found two specimens of this interesting leech in a small stream near Theydon Bois in April of this year. One of the specimens was found on a mass of vegetable matter which had fallen into the stream, and the other was taken swimming. One of our captures was accidentally killed during the process of identification, but the other has been safely installed in a vivarium in which some soil and a tuft of grass has been placed alongside a saucer containing water. The leech spends most of its time in the water and seldom indulges in terrestrial exercise, though this may happen during the night. Dutrochet's Leech is perfectly harmless and is unable to suck the blood of mammals and, like the Horse Leech (*Haemopsis sanguisuga*), feeds on earthworms, which are swallowed entire. The surviving specimen is about 100 m.m. long and 7 m.m. in diameter at the widest part when at rest. There is a well developed sucking disc at the posterior end, and at first glance the species might be mistaken for *Haemopsis sanguisuga*. The colour is a dark brownish green, and two dark brown bands extend along the dorsal surface, while the ventral surface is of a lighter tint. One of our specimens shows a distinct clitellum about the anterior third of the body. Typically there are four

pairs of eyes, but their number and position are subject to variation.

Dutrochet's Leech was first observed in England in 1850, in Regent's Park. Since that date numerous records of its occurrence have been published, but its appearance has been sporadic. In 1877 Mr. J. E. Harting ('*Zoologist*' Ser. 3. vol I., pp. 515–523) summarised the records of its occurrence in England. From this we learn that it had been observed at Lyne, between Dorking and Horsham, in 1869; at the Beddington Sewage Farm, near Croydon, in 1870; and at Elstree, Herts, in 1876. Mr. F. J. Bell ('*Zoologist*,' 1896, p. 264) records a large specimen from the Thames near Maidenhead, taken that year. Mr. W. A. Harding



DUTROCHET'S LAND-LEECH, *Trocheta subviridis*.
(*Kindly lent by the Publishers of the "Zoologist."*)

in a paper on British Leeches ("*Parasitology*" vol. iii., 1910), pp. 183–186) gives Capel, Surrey, as another locality, and states that in 1909 it was observed at the Withington Sewage works, near Manchester. Finally, the finding of two specimens in a garden at Penge in February, 1911, is described in the '*Zoologist*' for May of the current year (p. 155).

Mr. Harding is of the opinion that Dutrochet's Leech may possibly be indigenous in this country. Up to the present it has been found only in Italy, France and Algeria.

The particulars given with the above records show that the specimens were found either in gardens on lawns, paths or under boxes, or in streams contaminated with sewage—in all cases

where food, *i.e.* earthworms, are likely to be abundant. The stream near Theydon Bois where the specimens were found appears to be contaminated to some extent with effluent from a neighbouring farm.

Since the above was written, Mr. Bostock paid another visit to the locality and took eight specimens of the leech—five adults and three immature.

The writer is at present engaged in collecting material for a paper on the Essex Leeches, and would be very glad to receive help from members of the Club either in the form of notes on habits, folk-lore etc., or of specimens. The latter may be sent alive in boxes with damp moss, and the donors will receive due acknowledgement and the specimens will be preserved and deposited in the museums of the club.

THE PRESIDENTIAL ADDRESS DELIVERED AT THE ANNUAL MEETING, 1st APRIL, 1911.

By T. S. DYMOND, F.I.C., F.C.S.

In the words of our first president—"Our Society may be said to have for its scope the Study of Nature in the field—the furthering of science—the addition of something, however humble, to the general stock of human knowledge." In briefly reviewing its work during my three years' term as President, I propose to ask how far these objects have been carried out and towards what field of future work the experience of these three years leads us.

We cannot contemplate the "furthering of science," without dealing with both education and research. Education to be real must be permeated with the spirit of research, and research cannot expect to be effective unless the investigators have had the advantage of some training in scientific method and observation. Many an enquiry, in itself full of interest, has never been brought to scientific fruition, because of the investigator's want of scientific training.

It is now generally accepted that the furthering of Science should begin with the rising generation, and that, as far as elementary schools are concerned, the method of observation and enquiry should permeate the whole of the teaching, and the curriculum should include such a study of natural environment as will open the eyes and minds of the children. It

seemed to me, in taking office, that it was in the interest of the future of the Club, and indeed its duty, to do what was possible to foster this Nature-study in schools, and the Council supported my view.

The ball was set rolling by a Conference on the promotion of Nature-study and the services that may be rendered by local museums, at the Franco-British Exhibition in the Autumn of 1908, when Mr. Wilfred Mark Webb opened a notable discussion. This was followed up by a meeting of the Club with the West Ham and District Education Conference, held in this room early in 1909, at which it was suggested that classes in Natural History should be held for teachers at the Museum, that field meetings for teachers should be arranged during the summer months, and that the Museum should be utilized for School Nature-study.

You are all aware of the large extent to which the last suggestion has been carried out. One rarely passes through the Museum without seeing groups of little people in the quest of particular objects of study, and I am told that teachers bring their classes to the Museum for lessons. Moreover, series of field meetings for the teachers were arranged during the summer of 1909 and again in 1910, and in the former year these were followed by meetings at the Institute for identifying specimens and discussing the results. One of these field meetings took place in Hainhault Forest and was conducted by Mr. Cole and myself. Nearly a hundred teachers attended, and proved to be keen and intelligent students, anxious to learn all they could from their conductors, though little versed in the pursuit of Nature-knowledge on their own account, and the subsequent meeting at the Institute was also marked by genuine interest.

But systematic classes for study we unfortunately failed to establish, although I attended and spoke at the Annual Meeting of the Conference, and Mr. Cole offered his services. Mr. Paulson kindly interested himself in a scheme for a survey of the flora of the waste places of West Ham, under which each teacher and his class was given a collecting area, believing that this might lead to systematic work. That again was fruitless. Nevertheless the seed has been sown.

Meanwhile much has been done to complete the educational side of the Museum, and to many, as to myself, it must now

be a revelation of educational possibilities. Many of the provincial museums, though full of material, are monuments of wasted opportunities as far as its display is concerned. "He who runs may read" may be truly said of our Museum. The opening of the museum to a large public gathering on the occasion of the Annual Conversazone of the Institute, with the special exhibits arranged by the Curator and Assistant-curator and other members of the Field Club, is, Mr. Hogg is good enough to tell us, one of the educational features which makes the occasion a success.

With a few hundred pounds for equipment and curating, the Chingford Museum of Natural History might serve as important an educational purpose for the visitors to Epping Forest, i.e., the people of London and of London-over-the-Border, as is served by the Museum here for the people of this immediate locality. The Chingford Museum is in just the same state now as it was three years ago, and unless a regular income is assured from a public body, the Club cannot hope to make the Museum all it might be.

Nevertheless, as it stands, the Museum does good work. Thousands of visitors during the year examine its contents. Visits of classes of school children have become a regular feature. More and more it is becoming the recognised centre for Natural History rambles in the Forest. On the occasion of two such rambles, the one organised by the Walthamstow Teachers' Association and the other by the Nature Study Union, the Museum was visited by invitation of the Club.

Thus ends the record of what we have been able to do for the furthering of science by educational means. There is much more, I believe, to be done. Though one must for the present definitely abandon the idea of establishing classes for systematic study in connection with the Stratford museum, the small room upstairs might be definitely set apart for collections made or specimens of work done by junior naturalists and teachers; school Nature-study exhibitions might be periodically held in it and the best work from each retained as a permanent object lesson. The formation of local Natural History Societies among teachers and of Junior Naturalist Societies among boys and girls in Secondary and Evening Schools is much to be desired, and the Club might do much to foster such Societies.

Lectures arranged by the Club, of a semi-popular nature, such as that on "Insect-transformations" by Mr. Enock and that on "Surface Tension" by Messrs. Starling and Scourfield, if thrown open to a large section of the public, would serve both as a means of popularising knowledge, and of attracting new members to the Club.

I now turn to the work of the Club in the furthering of Science by adding to the stock of human knowledge. It is gratifying to record an uninterrupted flow of scientific papers; indeed, to cope with the supply, an additional meeting of the Club was held this session. Not only has the output been great in volume, but in standard many of the papers would do credit to the learned Societies.

First must be recalled the survey and renewal of the Boundary Stones of the Ancient Forest of Waltham. The work was initiated by Professor Meldola at the Annual Meeting three years ago, carried out for the Club by Professor Coker and Mr. Savidge with a grant made by the Essex County Council for the purpose, and completed by a perambulation of the Stones on 31st July in the following year (1909).

The Club has to congratulate itself on being the recipient of a series of valuable contributions to our knowledge of prehistoric man, as revealed by a prehistoric interment and Neolithic floors, by Mr. Hazzledine Warren and Mr. Francis Reader. Messrs. Whitehead and Goodchild have contributed to our knowledge of the botany of perhaps the same period by their investigations on Moorlog; and their results may form an important standard of comparison when the botanical composition of peaty deposits on our own coasts comes to be undertaken. Among many other papers, I hope that by Mr. Dent and myself on the "Reafforestation of Hainhault" may not be without use to the future workers in that region, as a record forming a starting point, as it were, from which "Nature in the making" can be observed.

The field meetings have greatly benefited by the appointment, on Mr. Cole's suggestion, of an Excursions Secretary, and Mr. Percy Thompson filled the post with such success that the number of field meetings held last year was just double that during either of the two previous seasons. Most important of these from the scientific point of view were the various dredging

expeditions and fungus forays and the newly instituted moss and lichen foray. Many of these forays have led to "finds" new to Essex and, on one occasion, new to Britain.

Turning now to the scientific work of the Club in the future, there are two pleas I wish to make. The first is a plea in favour of Meteorology. I hoped to have secured Mr. William Marriott, assistant-secretary of the Royal Meteorological Society, to address the Club on Local Meteorology and Phenology, but found it difficult to enlist sympathy in my project. I gathered that it was thought that the weather was a matter of national, not local, concern! For the purpose of national statistics of course I agree, but still there are many local problems which are of purely local interest and which only a local society can tackle.

To give an example, the rainfall in Essex varies to an extraordinary extent within very short distances. Mr. Chancellor's raingauge at the bottom of New London Road, Chelmsford, gives readings widely different from Dr. Thresh's at the top. We watch the storms following the valleys, yet expect greater precipitation at greater altitudes. However clearly the general laws governing rainfall are understood, we need numerous comparative determinations in order to understand the application of those laws to any particular locality, and in Essex such determinations are likely to give results of special interest and value, owing to its geographical position and character.

Again, how little we know of the hygroscopic condition of the air in Essex and the possibility of water condensation to such an extent as to render dewponds (if indeed they are dewponds) possible in the London Clay districts, which in times of drought suffer so severely. How fruitful even accurate comparisons of temperature between adjoining areas, differing in altitude, aspect or soil, might be in the lessons they teach (for example as to the planting of fruit trees to avoid late frosts). What a wealth of information remains to be collected upon the correlation of the opening of flowers, migration of birds, and appearance of insects, with weather conditions. Mr. Miller Christy recorded the abundant flowering of the Elm in Essex two seasons ago, but no member of the Club was able to tell us the meteorological conditions which were responsible, although the

question of flower-producing conditions is one of supreme importance to Essex fruit-growers. In such a field of meteorological and phenological work the humblest member of the scientific community can take part, and I feel convinced there are many members of the Club who would willingly work in this field, if the Club gave its benediction.

My other plea is in favour of the greater recognition by a society of naturalists of the utilitarian or economic side of investigations in natural science. The note of the scientific work of this Club, as of other learned societies in this country, is " knowledge for its own sake," and little advance in scientific knowledge is ever made unless this be the guiding principle of the workers. But I seem to see a propensity among naturalists to avoid observations which may have an economic value. We go fungus gathering in Epping Forest, but meanwhile gooseberry bushes are being destroyed by a fungus which very few of us have even learnt to recognise. We are charmed with the variations in some entomological rarity, and meanwhile thousands of black currant bushes at Burnham-on-Crouch are destroyed by a mite whose life history would well have repaid further study.

At the Walthamstow reservoirs Mr. Scourfield gave us an example of the aid which the naturalist can give to the water engineer, shewing that the purification of water is partly due to bacteria-devouring organisms, which form a sort of living felt attached to the filtering medium. Of far-reaching significance are the facts which have recently come to light upon the work of similar organisms in destroying the putrefying and nitrifying bacteria in the soil, and thus limiting fertility, so that any means of destroying these organisms without destroying the spores of bacteria (e.g. heating the soil, drying the soil, or applying various chemicals) enormously increases its fertility. The microscopists now tell us of some thirty bacteria-devouring organisms (leucocytes, protozoa, etc.) in the soil, but it is not to them that we can credit the profound influence of this discovery on agricultural science, but to an agricultural chemist, Dr. E. J. Russell, who by an arduous series of investigations, first excluded all chemical hypotheses to account for the observed effects of heating soil on the subsequent crops grown in it.

And it is not only for the sake of the economic well-being of agriculture that I plead, but also for the sake of societies of

naturalists such as this. Essex and some other Counties have already agricultural institutes, and it is probable that almost every county will shortly be similarly provided. The scientific work of these institutes must necessarily be chiefly economic and utilitarian, but out of that work, whether in the examination of soils and well waters, in treatments against insects or fungoid pests, in the identification of weeds, or in the breeding of new varieties, contributions to knowledge in the realm of pure science must necessarily be forthcoming, provided the st ff of workers receive any encouragement to record their observations. It is a matter for regret that the flow of contributions from the County Technical Laboratories at Chelmsford has ceased, and it is with the hope of re-establishing communication that a field meeting has been arranged in connection with the Laboratories for the study of a branch of mycology in which the staff of an agricultural institute necessarily takes an interest.

I cannot make these pleas without expressing my regret that during these three years I have not done more myself in the directions indicated. Indeed, my services to the Club sink into insignificance beside the services of many other members. First and foremost the Club is indebted, during this period, no less than during its whole existence, to the single-hearted devotion of its beloved and honoured Secretary. It is only a President who can quite realise the weight of responsibility—secretarial, curatorial and editorial—that falls upon Mr. Cole's shoulders, or the extent to which the life and vigour of the Club is due to his inspiration. We rejoice that he has been able to resume those responsibilities after his illness, no less than that his family anxieties are to some extent mitigated; indeed, we hope that his brother, our Assistant-Secretary, may again be seen at our meetings. To Mr. Miller Christy and Mr. Percy Thompson, the Club owes an enormous debt of gratitude, for the former, by assuming the presidential and editorial duties, and the latter, by assuming the secretarial duties, carried on the affairs of the Club during the long absence of the Secretary and myself. The balance sheet has proved to you how much we are indebted to Mr. Howard, our Treasurer. Lastly, the President desires to thank, in the name of the Club, the many other members, who by reading papers, preparing exhibits, taking part in discussions, attending our meetings, presenting

specimens to our museums, conducting rambles, procuring new members, subscribing to our funds, and taking part in our Councils, have contributed each his or her share to the Club's well-being.

NOTES ON THE RECENT OCCURRENCE OF CERTAIN PLANTS IN WANSTEAD PARK, ESSEX.

By the Rev. A. C. MORRIS, B.A.

[*Read 29th October* 1910.]

LAST winter much work was done in the matter of cleaning out the Ornamental Waters in Wanstead Park. The mud excavated from the bottom of the lake was deposited to a depth of several feet over a considerable area of waste land in the Park. Hoping to meet with some interesting botanical "finds" on this new mud-stretch, I asked permission from the Superintendent of Epping Forest to examine and collect specimens. He courteously at once gave the required permission, and the botanical results are of some interest. The most interesting discovery undoubtedly was the finding of a couple of specimens of the *Potentilla norvegica*, a Norwegian *Potentilla* which has not, I believe, been found previously in this county, though it has been found in Lincolnshire and Cambridgeshire. At first my thought was that seeds of it had been washed down the Roding and so found their way into the lake. This suggestion I made to a well-known botanist and member of the Linnæan Society, Dr. F. N. Williams, and he thought it quite possible. In a note to me he says: "*Potentilla norvegica* is a native of wet sandy places in Europe. It is much cultivated in gardens, and readily establishes itself as an escape from cultivation. I think it is quite possible that the River Roding may have carried the plant along as a garden escape. I see that G. S. Gibson, *Flora Essex* (supplementary notes) in *Bot: Exchange Club Report*, 1868, queries the plant as introduced into Essex. It grows wild in Norway, Denmark, and North Germany, but not in France or Belgium."

The 9th Edition of Babington's *Manual* quotes *P. norvegica* as "naturalised in Yorkshire and elsewhere." As it may crop up in some other Essex locality, and as the usual

botany manuals are distinctly brief in their descriptions of it, I give a fuller description taken in part from Spotton's *Canadian Flora* and from *Flora von Deutschland* by Schmeil and Fitscher, verified and added to by my own personal observation.

Stem repeatedly forked, erect, about 6 dm. in height, and at base 4–5 mm. in cross section; often reddish on one side and clothed throughout with stiff patent yellowish hairs. Leaves ternate; leaflets oblong, narrowed at both ends, coarsely toothed; ribs and edges of leaflets with stiff spreading hairs. Terminal leaflet the longest, often 5 cm. Inflorescence densely cymose, erect. Sepals 5 ovate pointed, at broadest part 5 mm., and in length 1 cm. Closed in fruit. Leaves of the epicalyx 5, about 4 mm. in breadth and 1 cm. in length, patent in fruit. Calyx and epicalyx fringed with hairs. Petals 5 obovate smaller than the sepals and pale yellow. Stamens 15–18. Carpels glabrous and wrinkled lengthwise.

Later in the year, however, another equally curious "find" suggested to me a more probable origin for this plant. This was a number of specimens of the *Aster tripolium*. This is a well-known plant of the salt marshes, and is, of course, quite common in our Essex salt marshes and by the sides of tidal creeks, but it is not found inland (save for a note in a German Flora—"*Selten an salzhaltigen stellen des Binnenlandes*" —"Rarely on salt retaining spots of the mainland"). The origin of these plants in this unusual spot undoubtedly must be the web feet of water fowl, probably the herons of Wanstead Park, which may often be observed in the quiet of the evening moving across the sky on their return from feeding on the marsh lands. I also found *Rumex maritimus*, the "Golden Dock," another salt-loving plant.

Possibly, then (and one might, perhaps, say probably), the seeds of the *Potentilla norvegica* reached their *situs* in Wanstead Park by the same means, and as once Darwin argued from the shape of a certain orchid that there must be an insect with a long proboscis capable of entering the flowers' honey gland (which later was verified), so one may be inclined to argue that somewhere on the little frequented parts of our Essex marshes there grow some specimens of the *Potentilla norvegica*. This is at least a fascinating theory, and if ever verified would read like a fairy tale.

For the rest there were a large number of the usual water plants—large, at least, when one considers the small area covered

by the mud deposit. Some plants grew in such extraordinary profusion that it seems to me certain that their seeds have been lying for a number of years dormant at the bottom of the lake. This was the theory that I had set myself to prove, and if not proven it is at least more than likely. To any one who attempted to wade breast high through the mass of *Polygonum* ("sorrel") growing there, it must seem almost certain that an accumulation of seeds gave rise to the unusual luxuriance of growth. Almost equally profuse were the more lowly growing *Ranunculus sceleratus* and the *Radicula palustris*. A second line of argument was the occasional presence of plants which I know are still to be found in the immediate neighbourhood of the Park (namely, round the lake of the Wanstead Golf Ground), but which have not in recent years been discoverable in the Wanstead Park itself—such as *Alisma plantago, Juncus bufonius* and *Bidens tripartita*. A third line of argument was the occasional presence of plants which I have never yet found even in the more secluded Wanstead Golf Ground—such as *Myosoton aquaticum* (better known as *Stellaria aquatica*, the Great Water-chickweed). This plant I have not myself met with in Essex before, and it is certainly rare in this neighbourhood; but on these mud stretches it is in abundance. *Veronica anagallis* and the gigantic *Angelica sylvestris*. The cumulative force of these three lines of arguments—

(1) Extraordinary profusion of certain plants;

(2) Presence of plants hitherto in recent years unknown in the Park, though known to exist close to it;

(3) Presence of plants unknown in the neighbourhood—certainly seems to point to a time when the flora of the margin of the Wanstead Park Lake was much richer than now, and to the fact that such flora has been lying dormant in living seeds, and has sprung into life when the chance presented itself.

I may add that Mr. McKenzie, the Superintendent of Epping Forest, is of the same opinion. "I am sure," he says, "your theory is correct, and that these seeds have been in the mud for years."

ANALYSIS OF SOME OF THE PLANTS FOUND IN WANSTEAD PARK,

Class A. Perhaps originating through the medium of the Herons:—*Rumex maritimus*; *Aster tripolium*; (?) *Potentilla norvegica*.

Class B. Exceptional in their profusion :—

Tussilago farfara ; Epilobium hirsutum ; Scrophularia nodosa ; Polygonum lapathifolium and *P. hydropiper ; Spiræa ulmaria ; Ranunculus sceleratus ; Radicula palustris ; Lythrum salicaria ; Lycopus europaeus ; Symphytum officinale.*

Class C. To be found in the near neighbourhood, but in Wanstead Park not recently hitherto.

Alisma plantago; Juncus bufonius ; Bidens tripartita ; Lychnis flos-cuculi ; Juncus acutiflorus ; Galium verum.[1]

Class D. Not found in the near neighbourhood.

Veronica anagallis ; Myosoton aquaticum ; Angelica sylvestris ; Atriplex hastata ; Oenanthe crocata ; Glyceria aquatica.

THE ESSEX FIELD CLUB—REPORTS OF MEETINGS.

DREDGING MEETING ON THE ESTUARIES OF THE ORWELL AND THE STOUR, IN CONJUNCTION WITH THE IPSWICH SCIENTIFIC SOCIETY.

SATURDAY, 23RD JULY 1910.

This meeting was held for the purpose of collecting marine animals and plants n the Estuaries of the Orwell and Stour. The weather was extremely unfavourable. To this cause, and the absence on holiday of many of the members of both Societies, may be attributed the small attendance.

The members of the Essex Field Club were met at Ipswich Station on arrival of the London train at 10.10 a.m., and were conducted by their colleagues of the Ipswich Scientific Society to the Railway Company's quay at New Cut, where lay the steam-tug "Eagre," of Colchester, which had been chartered for the expedition.

The voyage down the beautiful Orwell was somewhat marred by driving showers, until Woolverstone Park was reached, when a cessation (alas, only temporary) in the rain permitted of a landing at the "Cat House." Thence, a walk through the charming grounds towards Freston Tower was undertaken and much enjoyed by all.

Re-embarking at one o'clock, lunch was partaken of on board. When Pin Mill was reached, the dredge was put out and the vessel allowed to drift down stream with the tide, and from this point until Harwich was reached, repeated hauls were made by the two dredgermen employed. A vast number of Alcyonarians, Tunicates, Hydroids, Sponges, and Polyzoans, with various Crustacea, such as *Caprella* and *Talitrus*, and Amphipods, were obtained and bottled, in spite of the discomfort of the drenching rain.

From Harwich, the tug proceeded up the estuary of the Stour nearly as far as Wrabness, during which progression, dredging being impracticable, a very "grateful and comforting" cup of tea was enjoyed in the hold of the vessel.

Arrived at Wrabness, the vessel's head was turned down stream. Further hauls of the dredge were made, with varying success, from this point down to

1 Very large specimens; leaves almost invariably only 6 in a whorl instead of 8-12. possibly state caused by richness of *situs*.—A. C. M.

Harwich, and a various spots in Harwich harbour. Some hauls yielded *Echinus miliaris* by hundreds of specimens ; some fine *Solaster papposa* were taken ; and one huge Oyster, brought up near Wrabness, was estimated by our dredgermen (themselves experienced in the Colne Oyster Fishery) to be 15 years old.

The total yield of specimens was very considerable, and bids fair to prove of scientific value when gone over by experts. It will form an important addition to the museum at Stratford.[1]

At seven o'clock the members landed at Harwich Pier and proceeded to the "Three Cups" Hotel, where they inspected in turn the Nelson suite of rooms and 17th century fittings of this well-known hostel, and the famous *Clematis* in its central courtyard. A substantial meat tea was served in the Coffee Room, after which a short formal ORDINARY MEETING (the 284th) was held for the nomination of a new Member and other business, Mr. Miller Christy in the chair. Soon after, the party made way to the railway station, to catch the 8.15 train for home.

FIELD MEETING AT SOUTHMINSTER AND BRADWELL-JUXTA-MARE.

SATURDAY, 6TH AUGUST 1910.

The party assembled at Southminster Station at about 12.30, and at once proceeded to inspect the interesting Church of St. Leonard, being received at the entrance by the Reverend John Cole, brother to our Hon. Secretaries, who is temporarily in charge of the parish. The perpendicular north porch, with its room over the Norman south doorway, and the massive western tower were in turn objects of considerable interest to the visitors, and an extensive view was obtained by those members of the party who ascended the Tower. The relics of Nelson, preserved in the Vestry, also excited general interest, albeit that sundry doubters questioned the possibility of getting such bulky articles of furniture into the confined space of a cabin.

Lunch was served at the Railway Hotel, following which a drive was undertaken to Bradwell by brakes, via Asheldham, Dengie and Tillingham.

At Asheldham Camp, Professor Primrose McConnell, B.Sc., read a short account of what is known respecting this early earthwork, which may be of Danish origin, but which has been almost entirely obliterated by digging for gravel.

At Bradwell-juxta-Mare, the drive was continued through the village as far as Eastlands Farm, where the conveyances were left, and a walk was taken through the fields (noticing an experimental crop of Sugar-Beet, seemingly in fine condition) to the old Chapel of St. Peter-on-the-Wall, permission to inspect which had been kindly given by Mr. James Brown, the tenant.

Here, several addresses were given to the party, marshalled within the ancient ruin, by our Conductors. Mr. W. Howard-Flanders read an interesting account of the history of the Chapel and of its site (the Roman Othona), and Mr. Hugh McLachlan, A.R.I.B.A., followed with sundry

1 Mr. Whitehead took charge of the specimens collected, and he has prepared a full report on them, which appears in the present part of the ESSEX NATURALIST (See *ante*, pp. 193-198).

notes on the architecture of the building, and Mr. Cater, a Member of the Council of the British Archaeological Association, who was present as a visitor, added a few remarks of a general character. Votes of thanks were carried unanimously to these three gentlemen for their several communications.

Leaving the Chapel, a length of the original Roman wall of Othona was inspected, almost masked by overhanging bushes, and the visitors strolled down to the foreshore, where several of the more usual saltmarsh plants were collected on the saltings. Mr. Shenstone made some remarks on the ecology of plants, with special reference to our Essex saltmarsh forms (printed under the title of "The Coast Flora of Essex" *ante* pp. 129–133), and acted as referee for plants brought to him to name.

Five o'clock having now arrived, it became necessary to rejoin the conveyances, and proceed to Bradwell Rectory, where the Rev. J. R. B. Owen and Mrs. Owen welcomed the party to afternoon tea. The extensive gardens of the Rectory offered many objects of interest to the visitors, chief among these being an enormous fig tree, supported on posts and extending over a space some 57 feet in length; a grand old Holm Oak, and a Cork Oak, were also specially noteworthy. Some of the party also inspected the Church, with its fine Norman font, and the adjacent lock-up and whipping-post.

After tea, an ORDINARY MEETING of the Club (the 285th) was held on the lawn, Mr. Miller Christy, Vice-President, in the chair.

New Members.—The following were elected:—

Miss Dorothy Walthall, *Cantab Cottage, Hill's Road, Buckhurst Hill.*

Miss Dorothea Sparshatt, *Cantab Cottage, Hill's Road, Buckhurst Hill.*

Mr. Francis C. Hill, *Wardenhurst, Wanstead.*

A short abstract of a paper by the Rev. A. C. Morris, on the occurrence of *Potentilla norvegica* in Wanstead Park, was given by the Acting Secretary, and specimens of the plant exhibited. (See paper in the present part.)

A cordial vote of thanks to our host andhostess was then proposed by Mr. Eliot Howard and seconded by Dr. Robert Jones, and Mr. Owen suitably responded.

At 7 o'clock the brakes were in readiness and the return drive was made by a slightly different route to Southminster.

MEETING AT WALTON-ON-NAZE.

SATURDAY, 17TH SEPTEMBER 1910.

This meeting was for the purpose of studying the Geology and Botany of the district.

The party assembled at Walton station at 10.21 a.m. and proceeded through the town and along the beach to the Naze, noticing a considerable quantity of lignitized wood in *Septaria* from the London Clay, while several sharks' teeth from the same beds were picked up on the beach, washed out from the clay cliff. The exposure of Red Crag, overlying the London Clay, was reached by climbing, and collections were made of the very abundant, but mostly comminuted molluscan fossils of which the Crag is largely composed.

Mr. S. Hazzledine Warren, F.G.S., who acted as geological conductor gave a succinct general account of the various beds met with in the district and their fossil contents; following whom, Mr. P. G. H. Boswell, of Ipswich, who was present as a visitor, added some remarks, by request of the Acting-President, on the fauna of the Red Crag, and especially dwelt on the difficulty he felt, as an experienced worker in the Pliocene beds, in regarding the clays and sands, which overlie the Red Crag in the Naze cliff, as truly representing the Chillesford Beds of Suffolk.

Mr. Boswell also kindly undertook, in the absence through indisposition of Mr. Alfred Bell, who was to have accompanied the excursion as a palæontological referee, to name the Red Crag fossils met with.

At one o'clock, an *al fresco* lunch was taken, after which the walk was resumed along the shore, beyond the Naze, to the marsh lands lying between Handford Water and the sea. Here, Mr. R. Paulson, F.R.M.S., took the lead as botanical conductor, and called attention to the forms of saline plants, and beach plants, most characteristic of such habitats. Collections of very many of the commoner species of these plants were made by members, the most interesting being:—

Cakile maritima Scop.
Arenaria (*Honckenya*) *peploides* Linn.
Inula crithmoides Linn.
Limonium vulgare Linn.
Statice maritima Linn.
Spartina stricta Roth.

The common grasses *Triticum acutum* and *T. junceum* were badly attacked by *Ergot* and by some gall-insect.

The members had a somewhat trying experience in attempting a "short cut" across the Walton Salt Marshes, being compelled eventually, after crossing many muddy "fleets," to return by a roundabout route almost to their starting point.

High tea was served at the Pier Hotel, after which a short formal Meeting of the Club (the 286th) was held, with the Acting-President, Mr. Miller Christy, F.L.S., in the chair.

The names of three gentlemen were proposed for membership.

Votes of thanks were passed to the Conductors, and the Meeting terminated.

On the way to the station, an inspection was made of the ruinous condition of part of the esplanade, owing to a slip of the London clay cliff, the esplanade having been pushed bodily forward on to the beach, and massive blocks of concrete scattered about haphazard, a striking evidence of the enormous lateral pressure of viscous strata.

FUNGUS FORAY IN EPPING FOREST, AND 287th ORDINARY MEETING.

SATURDAY, 1ST OCTOBER 1910.

On this, the first Fungus Foray of the season, the district traversed was that between Chingford and Highbeach. The Meeting was a half-day one, and was attended by some members of the West Essex Branch of the British Empire Naturalists' Association.

The party assembled at the Club's Museum at Queen Elizabeth's

Lodge, Chingford, at 3 p.m., and after an informal inspection of the museum, struck out for the woodlands across Chingford Plain.

On entering the thicket, our Conductor, Mr. Francis G. Gould, made a few remarks on the object of the afternoon's ramble ; and, at his suggestion, the party divided into three groups, pursuing different routes, so as to cover a larger collecting area.

By this arrangement, in spite of the dry season and the consequent scarcity of fungi, a very fair collection was got together, and a number of interesting forms met with.

Tea was taken at 6 o'clock at the Head Quarters for the Meeting, the Roseville Retreat at Highbeach.

After tea, an ORDINARY MEETING of the Club (the 287th) was held, with the President, Mr. T. S. Dymond, F.I.C., F.C.S., in the chair.

Mr. S. Hazzledine Warren, F.G.S., gave a brief preliminary account of a discovery of a prehistoric interment, believed to be of the Bronze Age, made by himself and Mr. Miller Christy on the day following the Club's Meeting at Walton. (See *ante* pp. 198-208).

New Members.—The following were elected members of the Club :—

Major Tutor Lay, *Lexden Road, Colchester.*

Mr. Walter Smith, *" Roycroft," Buckhurst Hill.*

Mr. P. G. H. Boswell, *" Endsleigh," Wellesley Road, Ipswich.*

The Chairman drew attention to a petition to the Home Secretary against the exportation to the United States of lapwings, skylarks, and linnets, which lay upon the table for signature ; and referred to the extreme pleasure which he experienced at being able to resume his duties as President of the Club, after six months' enforced absence. He further expressed his gratitude to Mr. Miller Christy for so efficiently taking his place during the interval.

Mr. Francis G. Gould then gave a general account of the Fungi as a class, and their modes of reproduction, with especial reference to some of the finds of the day.

Mr. Shenstone added a few general remarks on the subject.

Mr. Nicholson, as a member of the British Empire Naturalists' Association, thanked the Club for the opportunity offered to his Association of joining the Club's excursion ; and Mr. Ryan, the Hon. Secretary of the B.E.N.A., associated himself in this expression of thanks.

The Chairman thanked Mr. Gould for his conductorship of the party, and for his very interesting lecture on the subject matter of the meeting. and proposed that a hearty vote of thanks be accorded to him by those present, which was unanimosuly carried.

The formal business of the Meeting then came to a close ; but a majority of those present stayed later to display, and obtain the names of, the fungi collected during the afternoon. Mr. Gould reports that over 40 species of Hymenomycetes were recorded ; the more interesting forms being :—

Russula azurea,

Tricholoma spermatica, and

Mutinus caninus ;

the remainder being species of common occurrence in the Forest, and some

of them poorly developed, and tending to be of abnormal form as a result of the dry atmospheric conditions then prevailing.

SECOND FUNGUS FORAY IN EPPING FOREST.

SATURDAY, 22ND OCTOBER 1910.

The Club's second Fungus Foray of the year was held on this day, when contingents of members of the Selborne Society and of the School Nature Study Union took part in the meeting, by invitation. The district traversed was from Loughton to Theydon Bois.

Mr. George Massee, F.L.S., of Kew Herbarium, acted as Referee for the Basidiomycetes and Ascomycetes; and Miss Gulielma Lister, F.L.S., was an enthusiastic leader and Referee for the Myxomycetes.

The morning party assembled at Loughton station at 10.51 a.m., and worked up through the woodlands by way of the Loughton Camp, Monk Wood, Broadstrood, and Hangboy Slade, to Theydon Bois, zealously collecting en route, and reaching the Headquarters at Oak Hill Farm, just before 3 o'clock.

The afternoon party assembled at Theydon Bois Station at 3.7 p.m., and proceeded at once to the Headquarters to join the others.

The combined forces then rambled through the Theydon woods until dusk, making further collections, during which time the specimens collected earlier in the day were being displayed and labelled by our official Referees in the Meeting Room.

Tea was taken at the Headquarters at 5.30 p.m., 85 members and visitors being present.

After tea, a short formal Meeting (the 288th) of the Club was held, the President, Mr. T. S. Dymond, F.I.C., F.C.S., in the chair. A telegram from Messrs. W. and B. G. Cole, regretting their inability to be present, was read by the Chairman, who undertook, on behalf of the meeting, to reply suitably.

The Chairman then called upon Mr. Massee, who gave a short account of the results of the day's collecting; he reported that the finds were extremely good in quality and had yielded one form new to Britain:—

Amanita virosa, var *grisea* (a poisonous variety), and at least three forms new to Epping Forest, viz.:—

Armillaria bulbigera,

Collybia bibulosa,

Pleurotus pantoleucus; and possibly a fourth new record,

Russula purpureus;

Mr. Massee suggested that the Club should publish an up-to-date list of Forest records to supplement those made by Dr. Cooke in the earlier years of its existence.

At the Chairman's desire, Miss Lister then remarked on the Myxomycetes collected.

Miss Lister subsequently reported as follows:—"I find, on examining the specimens miscroscopically, that we gathered on our delightful ramble more species than I at first realized. We found:—

Badhamia utricularis Berk.
Physarum nutans Pers.
Trichia affinis de Bary
T. persimilis Karst.

Fuligo septica Gml.
Stemonitis fusca Ehreub.
Comantricha obtusata Preuss.
C. typoides Rost.
T. scabra Rost.
T. varia Pers.
T. fallax Pers.
Arcyria punicea Pers.

Owing apparently to the dry season, none of the species that often abound in the forest on dead leaves are in our list. Of the thirteen species that were found, all were on dead wood, within which they had been feeding in the plasmodium stage; with the exception of *Badhamia utricularis*, whose food consists of living fungi such as *Stireum hirsutum* or *Corticium*.

The number of *Mycetozoa* that do injury to living plants is, as far as we at present know, extremely small. I mention this as I happen to have just noticed in the Report of the Fungus Foray for 1908, in ESSEX NAT., XV., p. 284, a rather misleading account of Mr. Massee's address, which might lead the casual reader to infer that an immense amount of damage was done by these organisms, whereas it is the true fungi, the microscopic rusts and cankers, not the Mycetozoa, that Mr. Massee tells us are responsible for so much mischief.

Votes of thanks were passed by the Meeting to both our Conductors, by acclamation.

Mr. Barter took the opportunity of expressing the thanks of the School Nature Study Union for the invitation which had been extended to the Members of his Society; and the formal proceedings terminated, the meeting resolving itself into a conversazione to examine and discuss the specimens displayed on the tables; while Miss Lister exhibited some of her particular pets under the microscope to an interested circle.

THE 289th ORDINARY MEETING.

SATURDAY, 29TH OCTOBER 1910.

This meeting was held as usual in the Physical Lecture Theatre, West Ham Technical Institute, at 6 p.m., the President, Mr. T. S. Dymond, F.I.C., in the chair.

New Members.—Mr. Edward Hardingham, *The Church House, Kelvedon Hatch.*

Mr. Arthur H. Craig, B.Sc., 102, *Hazelville Road, Hornsey Lane, N.*

Exhibits.—Specimens of hard Calcareous Sandstone, blasted from the bed of Harwich Harbour, were exhibited by Mr. Dalton, who stated that he had received the specimens from Mr. Percy Thompson. [See paper read, 28th January 1911.]

Mr. Warren exhibited a mass of Annelid tubes, composed of agglutinated sand-grains, from the shore at Walton-on-Naze. These are probably the tubes of *Sabellaria spinulosa* and are locally known by the fishermen under the term "ross."

Mr. Thompson exhibited a *fruiting* specimen of the Moss, *Leucobryum glaucum*, on behalf of Mrs. Thomspon, who had found the specimens in Monk Wood, Epping Forest, two days before. He remarked on the extremely rare occurrence of this moss in fruit, it having never previously been recorded in that condition from Epping Forest.

Mrs. Thompson had placed the specimen in the Club's Herbarium. [See *ante* p. 122.]

Mr. T. W. Reader exhibited photographs taken on various excursions of the Club during the present year, and he reported on recent additions to the Club's Library.

Mr. H. Whitehead read a "Report on the Marine Organisms dredged from the estuaries of the Orwell and Stour on the occasion of the Club's Dredging Expedition in July last," the specimens forming a special exhibition at the Meeting. Mr. Whitehead illustrated some of the forms of Pycnogonids found, by means of lantern photographs, and added an interesting verbal account of the various specimens on exhibition. [The paper is printed *ante* pp. 193-198].

The President suggested that the employment of a minute quantity of peroxide of hydrogen would restore the colouring lost by the immersion of the specimens in formalin. And he thanked Mr. Whitehead, in the name of the Meeting, for his Report, and for the excellent manner in which he had preserved, and exhibited, the specimens.

Mr. C. Nicholson then read a paper:—"Notes in the Alien and Casual Plants of Essex," and illustrated his remarks by numerous herbarium specimens of the plants mentioned, most of them being from the Hale End and Woodford district, but others, exhibited in illustration of Essex records, being from various parts of the country.

The Reverend A. C. Morris followed with a paper on a cognate subject:—"Notes on the Recent Occurrence of Certain Plants in Wanstead Park." and exhibited dried specimens of the plants referred to.

Both these papers are printed in the present part of this journal.

A discussion followed the reading of these two communications, in which the President, Messrs. Shenstone, Paulson, Dalton, Thompson, and the authors took part.

The President said that, without oxygen, seeds *cannot* germinate, and they may exist for many years inert in the absence of oxygen; water need not have any deleterious effect upon them. He thought it probable that Lucerne might have been sown on railway banks as helping, from its deep roots, to bind together the earth, and hence its appearance as a "casual" in such spots.

The President proposed that the thanks of the Meeting should be accorded to Messrs. Nicholson and Morris for their interesting communications.

AN AUTUMN MOSS AND LICHEN FORAY.

SATURDAY, 12TH NOVEMBER 1910.

This meeting was held at Theydon Bois, some members of the Selborne Society being also present by invitation. The Referees were: For the Mosses and Hepatics, Mr. E. M. Holmes, F.L.S., and for the Lichens, Miss Lorrain Smith, of the British Museum of Natural History, and Mr. Robert Paulson, F.R.M.S. The meeting was an all-day one, and comprised a morning and an afternoon party.

The morning party assembled at Theydon Bois Station at 11 a.m., and proceeded through the village to Oak Hill and thence through the

Forest to the "Wake Arms" district, zealously collecting en route, and later worked back to Oak Hill to meet their afternoon colleagues, who reached this spot at about 3.30 p.m.

Some interesting finds were made during the day, the more important discoveries being as under:—

Club Moss —*Lycopodium inundatum.*

True Mosses—*Bartramia pomiformis, Pleuridium, nitidum, Sphagnum* bearing male flowers, and numerous *Hypna.*

Hepatics. —*Fossombronia pusilla, Metzgeria furcata,* and *Lapidozia reptans.*

Lichens. —*Bœomyces roseus, Bœomyces rufus, Cladonia coccifera, Physcia cæsia, Lecidea lucida,* and *Peltigera spuria.*

Tea was taken at the Headquarters, Oak Hill Farm, at 5 o'clock, after which a short formal ORDINARY MEETING of the Club (the 290th) was held, with Mr. J. C. Shenstone, F.L.S., Vice-President, in the chair. Two of our Conductors (Miss Lorrain Smith and Mr. Holmes) had unfortunately been compelled to leave earlier, but the third, Mr. Paulson, gave a general account of the Lichen-Flora of the Forest, and was followed by Mr. Percy Thompson, who spoke on the abundant opportunity for the study of Mosses and Hepatics offered by the district in which the meeting was held, and by others. Cordial votes of thanks to the Referees were given, and the meeting ended.

THE 291st ORDINARY MEETING.

SATURDAY, 26TH NOVEMBER 1910.

This meeting was held as usual at Stratford at 6 p.m., the President in the chair.

New Member.—Mr. W. Zimmerman, of *Woodberrie Hill, Loughton,* was elected as a member.

The President congratulated the Club upon the return of the Hon. Secretary and Curator, Mr. Wm. Cole, after his protracted illness; and Mr. Cole replied, thanking the members present for their kind reception, and expressing his gratitude to Mr. Percy Thompson and Mr. Christy, who had taken up the threads of the secretarial and editorial work during his absence.

Donations to Museum.—The Acting Secretary exhibited a case of four Barn Owls, captured at East Ham, which had been presented to the Club's Museum at Stratford by a former Member, Mr. Savage, and also a series of Red Crag fossils presented by Mr. Alfred Bell, of Ipswich, in illustration of his paper to be read that evening. The thanks of the Club were duly accorded to the respective donors.

Mr. Miller Christy (in the absence of Mr. Guy Maynard, and on his behalf) exhibited an ivory ball, found in a gravel pit near Arkesden, which he considered to be a billiard ball, made of elephant's ivory and exhibiting, when cut in sections, the characteristic engine-turned markings of such ivory; he could not give even a guess at its age.

In the discussion which followed Mr. Christy's remarks, Mr. Whitaker considered that a couple of hundred years amongst gravel would suffice

to stain the specimen as now seen. Mr. E. T. Newton thought there was very great difficulty in distinguishing between elephant and mammoth ivory; and remarked that the reduction in girth in one direction, which gave a somewhat elliptical contour to the specimen, might be due to rolling amidst the gravel; but Mr. T. Reader thought there was no possibility of rolling in the particular bed from which the specimen came. Mr. Hazzledine Warren reminded the meeting that various sizes of billiard balls were made, and that shrinkage in billiard balls was frequent, rendering them untrue in play; the shape of the specimen exhibited was, he thought, entirely due to shrinkage. Mr. Cole doubted the specimen being a billiard ball, and suggested that earlier games of ball, such as "cup-and-ball," were played. The President thought that the scratched surface was evidence of wear. Mr. Christy agreed that the reduction in girth was probably due to shrinkage rather than to rolling; and, on the President's motion, the thanks of the Meeting were tendered to Messrs. Maynard and Christy for the exhibit and account of same.

Mr. W. Whitaker, B.A., F.R.S., then gave a verbal report of the Meeting of the Corresponding Societies at the British Association's Meeting at Sheffield, during the past summer; which report led to a general discussion, in which the President, Messrs. Cole, Avery, Wilson, Warren, Nicholson, Newton, and Dalton joined, and Mr. Whitaker replied on various points raised. On Mr. Whitaker's motion, seconded by Mr. Wilson, it was decided that the question of proposed reduction in price of the Geological Survey Maps should be remitted to the Council of the Club for consideration and action.

In the absence of the author, the Acting Secretary then read, partly in abstract, Mr. Alfred Bell's paper on "The Zonal Stratification of the English Pliocene Deposits."

In the ensuing discussion, Mr. Whitaker expressed his very great appreciation of Mr. Bell as a most careful and accurate observer; he considered, however, that the division of the Pliocene into zones was unnecessary, as there was no evidence of any great length of time during its deposition; he doubted whether the differences of faunal contents in the various beds were not due to change of conditions rather than to lapse of time, and referred to the intermingling of shells from older zones. In his opinion, the Pliocene in East Anglia need only be divided into Lower (or Coralline) Crag and Upper (Norwich and Red) Crag. Mr. Newton endorsed the warm appreciation of Mr. Bell, and remarked upon the intimate knowledge of Crag species possessed by the author; he thought it important that the paper should be published. Mr. Warren considered that we should have more information on the supposed worked flints before accepting them as such. Mr. Whitaker would express no opinion on the flints themselves; while hesitating to accept them as "worked" until further expert evidence had been brought forward, he had no doubt as to the bed in which they were found, which was the base of the Red Crag. He was present with Mr. Bell when some of the flints were obtained.

The President proposed a very warm vote of thanks to Mr Bell for his valuable communication, and for the gift of the fossils which accompanied it.

THE 292nd ORDINARY MEETING.

SATURDAY, 17TH DECEMBER 1910.

This Meeting was held at Stratford, the President, Mr. T. S. Dymond, F.I.C., F.C.S., in the Chair.

New Member.—Mr. H. Scott Orr, of "*Haddon,*" *Fairfield Road, Woodford Green,* was elected.

The President announced that Professor R. Meldola, F.R.S., first President and one of the Permanent V.P.'s. of the Club, had received the Honorary Degree of D.Sc. at Oxford University, the announcement being warmly acclaimed by the members present; on the motion of Mr. Whitaker, seconded by Mr. E. T. Newton, the meeting decided that the hearty congratulations of the Club should be sent to Prof. Meldola on the honour conferred upon him. (See *ante* p. 192.)

On the motion of Mr. Avery, the Secretary was requested to send a letter of condolence to Sir Archibald Geikie, P.R.S., one of the Honorary Members of the Club, on the recent sad loss which he had sustained by the death of his only son.

Exhibits.—Mr. Nicholson exhibited six clutches of eggs of the House Sparrow, showing the "odd" egg in each clutch, supposed to be either the first or last egg laid of each "clutch." Mr. Miller Christy, while fully recognizing the common occurrence of the "odd" egg, could offer no scientific reason for its existence. Mr. Whitaker remarked on one pig in each litter being commonly smaller than the others; which pig, Mr. Christy mentioned, was in Essex known as a "cad" (pronounced "kaid") pig; and Miss Jane Cole added that this was a term of endearment, known also in Huntingdonshire, signifying "pet."

Mr. Paulson exhibited an enlarged photograph[1] of a recentlydescribed lichen, *Gongylia viridis* A.L. Sm., first recorded from Surrey in the beginning of the present year (1910), and which had been lately found in Epping Forest on the occasion of the Club's Lichen Foray on 12th November last. The lichen was described by Miss A. Lorrain Smith in the *Journal of Botany* for February 1911, and is included in the *Monograph of British Lichens,* prepared by Miss Smith, and printed by order of the Trustees of the British Museum. In Epping Forest *G. viridis* occurs on sandy soils round gravel-pits, and it has since been found by Mr. Thompson in at least three localities in the forest.

Mr. Francis W. Reader read a paper entitled "Notes on a Neolithic Floor near Rayleigh, discovered by Mr. H. Rand," which he illustrated by lantern photographs and followed by sundry remarks on the accompanying specimens of pottery and flint implements and flakes, which evidenced, in his opinion, a stage of Neolithic culture.

Mr. Hazzledine Warren read a paper, "Remarks on the Correlation of the above 'Floor' with similar Beds elsewhere," and followed with some general observations on the chronology of prehistoric archæology, illustrating his remarks with lantern photographs of Neolithic implements and pottery, found by himself at various sites on the Essex coast and elsewhere.

1 The photograph has since been reproduced in *Knowledge* (May, 1911), together with a description by Mr. Paulson. (Ed.)

Both these papers are printed in the present part of the ESSEX NATURALIST.

During the discussion which followed the reading of these papers, Mr. Hinton gave an account of the bones found at the Hull Bridge (Rayleigh) site, one being the left os innominatum of a small pony, the other the lower portion of a shed antler of a Deer, which he considered might be Reindeer, but was not Red Deer. Mr. E. T. Newton, F.R.S., though not positive, thought the antler might, after all, be that of a young Red Deer. Mr. Kennard considered the implements found at Hull Bridge were of what he called the "Thames" type, comparable with the cave type, that is to say, of early character. He exhibited two conjoined flakes from Kent, which illustrated the origin of the apparent "secondary working" on some of the Hull Bridge flakes, due in reality to earlier flakes having been struck off in a cross direction. Messrs. Dalton and Cole joined in the discussion, and Messrs. Reader and Warren replied to various points raised. The President expressed his appreciation of Mr. H. Rand's part in the work of discovery and making known of this interesting site, and thanked Messrs. Reader and Warren for their respective communications.

Dr. A. E. Salter then read, in abstract, his paper on "Sarsens, Basalt and other Boulders in Essex," exhibiting many fragments of stones tabulated, and illustrating his remarks by maps showing the distribution of the Boulders throughout the county, and by lantern photographs of some of the examples. A discussion followed the paper, in which Messrs. Christy, Dalton, Thompson, T. Reader and Whitaker took part. Mr. Whitaker thought that Sarsens should be separated from Boulders proper, as not being travelled stones, since many of them came, in his opinion, from Bagshot Beds, which once covered the entire County. Dr. Salter replied and Mr. Cole announced that the rock-specimens exhibited in illustration of the paper had been presented by Dr. Salter to the Club's Museum. A vote of thanks was unanimously passed to Dr. Salter for his paper and the gift to the Museum.

THE 293rd ORDINARY MEETING.

SATURDAY, 28TH JANUARY 1911.

This meeting was held as usual at Stratford, Mr. T. S. Dymond, President, in the chair.

Letters of thanks were read from Sir Archibald Geikie and Prof. R. Meldola, in reply to votes of sympathy and congratulation respectively sent to them by the Club.

Exhibits.—Mr. Somerville Hastings, F.R.C.S., etc., exhibited a special series of lantern photographs and coloured transparencies of Alpine flowering plants growing in their natural habitats on the Swiss Alps, and gave a brief description of each plant illustrated and its mode of occurrence, habits, etc.

An interesting discussion ensued, carried on by Mr. Paulson, Mr. Nicholson, Mr. Malby, Mr. F. G. Gould and the President, on the resemblance between Alpine Plants and Desert Plants, their behaviour when cultivated in gardens, the possibility of growing them near London, etc., and Dr.

Hastings replied to several points raised. At the close, on the motion of the President, a warm vote of thanks was accorded to Dr. Hastings.

Papers Read.—Mr. Percy Thompson read a "Note on the occurrence of Stony Beds underlying Harwich Harbour," the communication being illustrated by specimens of the rocks referred to. The paper will be printed in the ESSEX NATURALIST. Mr. W. Whitaker, F.R.S., made some comments on the subject, which will be appended to the paper.

Mr. Hazzledine Warren, F.G.S., then read a paper "On a Pre-historic Interment found near Walton-on-the-Naze," illustrating the same by the exhibition of the human remains found, and by lantern photographs of the skeleton before removal from the grave. (The paper is printed *ante* pp. 198-208).

A lengthy and interesting discussion ensued, in which the President, Messrs. Christy, Paulson, Avery, Francis W. Reader, Whitaker, Thompson and Dalton joined.

The President proposed a hearty vote of thanks to Mr. Warren for his communication, which was carried by acclamation, and the meeting ended.

THE 294th ORDINARY MEETING.

SATURDAY, 4TH MARCH 1911.

Meeting held as usual at Stratford, Mr. T. S. Dymond, F.I.C., President, in the chair.

New Member.—Mr. George Morris, *The Friends' School, Saffron Walden*, was elected a member.

In accordance with the Rules, nominations were made of new members of Council and officers in view of the Annual Meeting.

The President gave notice of a proposed alteration in Rule III. (See report of Annual Meeting.)

Exhibits.—Mr. Miller Christy, F.L.S., showed two living Harvest Mice (*Mus minutus*) and gave some interesting details as to their habits in confinement. He had kept Harvest Mice in captivity, on and off, for 20 years, and his experience was that the animals were tame from the first capture; individuals under his care had lived for two or three years, but he was ignorant of their normal span of life. A discussion ensued, in which many members joined, and Dr. Graham mentioned that Harvest Mice found in Southern Scotland were darker in colour than those exhibited.

Mr. Hazzledine Warren, F.G.S., exhibited some *Calcined Flints* taken from a "hearth" some nine to twelve inches beneath the present surface, at Debden Slade, in Epping Forest. The site appeared to him to have no connection with a "charcoal hearth," of which numerous examples occur in the vicinity. No charcoal and no pottery occurred associated with the flints. The platform on which the flints were scattered was almost obliterated by subsequent denudation, pre-supposing a considerable antiquity for the "hearth." Such calcined flints were almost always associated, in Mr. Warren's experience, with pre-historic remains, whether

they had been used as "pot-boilers" or for other purposes. Mr. Warren detailed a successful experiment, which he had himself made, to boil water by dropping heated flints into cold water, and remarked that a similar method is adopted in Japan to obtain steam-baths.[1]

The exhibit called forth considerable discussion, in which Messrs. Cole, Shenstone, Thompson, Christy and Prof. Meldola took part.

In reply to various points raised, Mr. Warren stated that the "hearth" referred to lay close to the junction of two streamlets, only a few yards from either; he thought that the site was quite possibly a "potash-floor," and he had not formed any opinion as to a possible connection with the neighbouring Loughton camp.

Mr. Warren also reported that, at Walton-on-Naze last Christmas, he had seen boys picking up "copperas" which, they informed him, was ground up in the Walton Tidal Mill and sent away.—Mr. Miller Christy remarked that the "copperas" industry had entirely ceased in Essex for 30 years past, so that he could not understand for what purpose these stones were now being gathered.

Mr. B. G. Cole sent for exhibition a set of specimens of the Peacock Butterfly (*Vanessa io*) variety *cyanostica* (Raynor) bred from caterpillars taken at St. Osyth during the last summer.

Papers Read.—Mr. H. Whitehead, B.Sc., on behalf of himself and Mr. H. H. Goodchild, read a paper entitled "Further Notes on Moorlog, a Peaty Deposit from the Dogger Bank," supplemental to his previous communication published in the ESSEX NATURALIST (vol. xvi., pp. 51–60). The paper was illustrated by lantern photographs and maps.

Mr. D. J. Scourfield, F.R.M.S., followed with a verbal account of the Entomostraca he had identified in the washings from the peat sent him for examination. He stated that these amounted in all to some 18 species, nearly all Cladocerans. No Copepods occurred, and very few Ostracods, one form only (a *Cytheridea*) being a brackish-water species; all the rest were fresh-water forms.

An interesting discussion followed, carried on by Messrs. Warren, Thompson, McLachlan, Dalton, Nicholson and Dr. Graham, and Mr. Whitehead replied to several enquiries made.

The President proposed a vote of thanks to the authors, which was heartily carried.

Mr. C. Nicholson read "Notes on *Plusia moneta* in Britain" and exhibited specimens and photographs of the moth and its cocoon; following which Prof. R. Meldola, F.R.S., and Mr. W. Cole added some further particulars regarding the occurrence of the moth and some of its near relations in Essex and elsewhere.

The thanks of the meeting were accorded to Mr. Nicholson for his paper.

Owing to the lateness of the hour, it was decided not to read the Rev. W. K. Wyley's communication, entitled "A note on some Ichneumon-

1 It is stated in Johnson's *Folk-Memory* (1908), pp. 112-13, that the use of the Pot-boiler was continued until late in the historic period. "Linnæus, whilst making his Northern tour, saw the inhabitants of Bothland brewing beer in this way. And at the present time the Austrian peasant drinks such beer, which he calls 'stone-beer.'" (Ed.)

stung Larvae" *in extenso*; at the request of the President, Mr. W. Cole gave a brief *résumé* of the paper.

THE ANNUAL MEETING AND 295th ORDINARY MEETING.

SATURDAY, 1st APRIL 1911.

This meeting was held at Stratford, as usual; Mr. T. S. Dymond, F.I.C., President, in the chair.

New Members.—The following were elected:—

Miss Fanny Lodge, 18, *Stanhope Gardens, Ilford.*

Mr. George Rickword, F.R.Hist.S., *Librarian, on behalf of the Committee of the Colchester Public Library.*

Rev. W. K. Wyley, *Helions Bumpstead Vicarage, Haverhill.*

Mr. W. Whitaker, F.R.S. (an Hon. Member, on taking office as President).

The Hon. Secretary read, in abstract, the report of the Council, and presented the accounts of the Tea Fund.

The Hon. Treasurer presented his Financial Statement (printed in the *Year-Book*) and added an appeal for increased membership, and also asked for contributions to the funds of the Forest Museum. He moved that the statement be adopted by the meeting, and Mr. Victor Taylor seconded. Carried unanimously.

President.—The President announced the Council's nomination of Mr. William Whitaker, B.A., F.R.S., F.G.S., as President for 1911–12, which proposal, on being put to the meeting, was enthusiastically carried.

Council and Officers.—At the meeting on 4th March, the following members retired from the Council:—Messrs. Bryan Corcoran, Francis W. Reader, Victor Taylor, and J. M. Wood. They all offered themselves for re-election, and were duly nominated.

As officers the following were nominated:—*Treasurer*, Mr. David Howard, J.P., F.C.S., F.I.C.; *Hon. Secretaries*, Mr. W. Cole and Mr. B. G. Cole; *Librarian*, Mr. Thomas W. Reader, F.G.S.; *Auditors*, Mr. Walter Crouch, F.Z.S., and Mr. F. Reichert.

No other members having been proposed, the above-named gentlemen stood elected as members of the Council and Officers for 1911–12, and were so declared by the Chairman.

Alteration of Rule.—On the proposal of the Council, it was unanimously agreed that in Rule III., the words "Assistant Secretary" should be altered to "one or more Assistant Secretaries," and Mr. Percy Thompson was chosen one of the Assistant Secretaries. Mr. Thompson will also act as the Hon. Excursions Secretary.

Presidential Address.—The retiring President, Mr. Dymond, then read his Presidential address (*ante* pp. 221-228).

Mr. Miller Christy proposed that the hearty thanks of the meeting should be accorded to Mr. Dymond for his services as President, and that he should allow the address to be printed in the journal of the Club.

Mr. Shenstone seconded. Carried unanimously. This concluded the business of the Annual Meeting.

Exhibits.—Mr. W. H. Dalton, F.G.S., exhibited (1) the left half of the lower jaw of a *Rhinoceros*, supposed to have come from the Ilford pits, which had long been the property of the Club. Only part of one molar tooth is lost. Unfortunately, in the act of placing it in the Museum, an accidental slip reduced it to almost its original fragmentary condition, but not beyond the possibility of repeating the restoration. Mr. E. T. Newton, F.R.S., said that probably the jaw was that of *Rhinoceros leptorhinus*, an old animal.

Mr. Dalton also exhibited (2) Basal conglomerate of the Carboniferous Limestone, in contact with the Silurian floor, at Malham Tarn (the source of the river Aire), West Yorkshire, filled with Silurian pebbles. The old floor of this region consists of Pre-Cambrian ("Ingletonian"), Lower and Upper Silurian, bent into great folds, and eroded to a nearly horizontal floor on which the Carboniferous series rests. (3) Corals, encrinites, etc., from the uppermost beds of the Carboniferous Limestone of the same district. (4) Shelly conglomerate from Woolwich Beds, Charlton, Kent. (5) Oligocene limestone fron Constantine, Algeria, largely composed of shells of Helicidæ; subsequently silicified, decalcified, and partly charged with crude petroleum.

Mr. John French exhibited some Palæolithic implements from a plateau Brick-earth at Causeway End, Felstead. He explained that the thick patination of the surfaces of the implements agreed with that on other fractured flints in the deposit and assimilated them therefore in point of age. The evidence for their antiquity was to be found in the brick-earth which, when in a semi-fluid state, settled in a concavity on the plateau. This brick-earth has now by the long process of denudation become a convexity on two of its sides, and the collecting ground of this deposit has also long since been inaccessible on account of other channels of denudation. He thought the implements should therefore be referred to early Pleistocene times.

Mr. Henry Mothersole sent for exhibition the "hoard" of *Bronze Socketted Celts* and a few lumps of metal, found some 30 years ago at Little Baddow, Essex, and described by Mr. Henry Corder in the *Transactions* of the Club for 1881 (vol. ii., p. 31). These specimens had recently come into Mr. Mothersole's possession. The "find" consisted originally of twelve pieces. One of these is now missing—a piece of unwrought metal, referred to in Mr. Corder's note as having been cut. Mr. Mothersole described the celts, and said that both pieces of the unwrought metal had one side curved, indicating that they were cooled in a vessel having a rounded bottom, probably the crucible.

In the course of the ensuing discussion, Mr. Francis Reader expressed the opinion that the "hoard" was of late Bronze Age date, as evidenced by the socketted celts, and was probably the "stock-in-trade" of a travelling smith. Mr. Miller Christy referred to similar hoards having been met with at Arkesden and elsewhere in the county. The opinion was expressed that the specimens should be figured in the ESSEX NATURALIST.

Mr. C. Nicholson exhibited some "fruits" of a species of Oat, *Avena sterilis*, a South European plant, possessing hydroscopic awns which assist in the self-burying of the fruit, and so propagate the plant; and he demonstrated the creeping and burying properties of the fruits. Mr. Christy referred to some North American grasses, of the genus *Stipa*, which had similar propensities, but on an exaggerated scale, their awned fruits sometimes becoming entangled in the wool of sheep, and killing the animal by boring into its body.

Mr. D. J. Scourfield exhibited living specimens of a minute COPEPOD, which he had obtained in June 1910, from water accumulated in a little hollow in a tree (in the angle between the trunk and a large partly exposed root) near the King's Oak in Epping Forest. He had previously found the same form in a similar position near Theydon Bois in 1904. It was apparently an undescribed species of *Moraria*, but, owing to the scattered state of the literature dealing with fresh-water Copepods, it was not possible to state definitely whether it was really new or not. In any case, it was a new species to Britain. A very remarkable thing about it was its extreme tenacity of life. The little tube exhibited (about 3 inches long and 1 inch diameter) had had nothing whatever added to it except clean water from time to time, and yet the animals had been able to live, and apparently even to increase in it, for nine months, their nourishment being obtained, one must suppose, from the small quantity of very innutritious-looking sediment originally taken with the collection. But more striking still was the previous case when living specimens were found in a tube kept in the same way for more than four years, viz.: from May 1904 to October 1908. By means of a sketch on the blackboard, Mr. Scourfield explained some of the principal features of the organisation of the species, calling particular attention to the anal plate, which was marked by a series of shallow radiating wavy folds and a faintly crenulated edge, a type of plate not previouly seen in any species of the genus. The name of the genus, *Moraria*, was derived from Loch Morar, in the west of Scotland, where the first known species were found by Dr. T. Scott.

Mr. W. Cole exhibited the collection of Epping Forest Lichens presented to the Museum by Messrs. Paulson and Thompson last year, and which had now been suitably mounted in glass-topped boxes. The specimens were illustrative of the donors' paper in the ESSEX NATURALIST (*ante* pp. 136–45).

Also, samples of the Club's Herbarium of British Flowering-Plants, which had been collated and arranged by the Rev. A. C. Morris, B.A., and Mr. Henry Whitehead, B.Sc. He read a report on the Herbarium by Mr. Morris, which will be embodied in a "Museum Note" in the ESSEX NATURALIST.

A very cordial vote of thanks was passed to the Rev. A. C. Morris, for his long-continued labours in arranging the Herbarium.

Mr. Cole also exhibited a Bill-hook which had been used for at least 100 years as a tool in asserting the lopping rights on the Forest at Loughton on the 11th day of November in each year. The hook was formerly owned by Robert Higgins, of Baldwin's Hill, Loughton, uncle to Thomas Willingale; later it came into the possession of Thomas Willingale, and from him descended to Samuel Willingale, who had now presented it to

the Club. The presentation of this interesting relic was due to the kindness of Mr. Ernest Linder, B.Sc., who had previously presented the Axe used in the same ceremony. (*See ante* page 176.)

The thanks of the meeting were accorded to Mr. Willingale and to Mr. Linder for this memento of an old Forest custom.

EXHIBITIONS AT THE ANNUAL CONVERSAZIONE.

SATURDAY, 25TH FEBRUARY, 1911.

Following the precedents of former years, advantage was taken of the holding of the Annual Conversazione at the Municipal Technical Institute to make in the Museum some exhibitions and demonstrations of interest. The building was closed to the general public, enabling this to be done.

Various forms of Pond-life and other objects were exhibited under microscopes kindly lent by members of the Club. These objects were "demonstrated" during the evening by Mr. J. Wilson, F.R.M.S. (who furnished the bulk of the aquatic animals), Mr. John Avery and Mr. Avery, Junr., Mr. J. C. Shenstone, F.L.S., Mr. J. Bostock, Mr. H. Whitehead, B.Sc., Mr. W. Cole, A.L.S., and others.

In the small gallery, Mr. John Gray, B.Sc., A.R.S.M., *Secretary to the Anthropometric Committee of the British Association*, and his Assistant gave a demonstration of his apparatus for the Measurement of Perseveration, commonly known as the "Mind Measuring Machine." When the nerve cells of the brain are excited by an external stimulus, the excitement appears to persist for a longer or shorter time after the primary stimulus has ceased. This property of the neural matter of the brain has a great influence on the formation of associations, and is known to psychologists as Perseveration. In Mr. Gray's apparatus the persistence of colour sensation is measured by the use of a revolving mirror to reflect red and blue coloured light in rapid succession into the eye of the subject being tested. The coloured light is produced by passing the light of electric incandescent lamps through coloured glasses mounted on the upper and lower sides of the apparatus. The results obtained are compared with a table showing various mental characters associated with degrees of perseveration ranging from Class I. "Extremely Low Perseveration" to Class VII. "Extremely High Perseveration." The experiments proved to be very interesting and Mr. Gray secured a large number of measurements during the evening, and so attractive were they that further tests were made on the ensuing Monday evening. (Reference should be made to a paper read by Mr. Gray before the British Association in 1910.)

Another subject which attracted much notice was an exhibition illustrating some of the points raised in the recent discussions on nourishing forms of Bread. Samples of wheat, flour and bread were kindly sent by many millers and bakers, and preparations and diagrams illustrating the structure of the wheat grain and the composition of flour were shown. Our Member, Mr. Bryan Corcoran, C.C., so well-known as an authority on milling, gave lecturettes during the evening, and attracted attentive audiences. Mr. Corcoran's eminently practical remarks were of the highest value, and deserve wide diffusion. The merits of the old English

full-wheat loaf, which has so unhappily largely gone out of our national menage, was practically tested by the company, with the aid of some finely baked loaves and fresh-butter. The bread show was continued during the ensuing week, and it is hoped proved to be of educational value in a subject which almost up to the time of the exhibition had been most disastrously neglected.

A NEOLITHIC FLOOR IN THE BED OF THE CROUCH RIVER, AND OTHER DISCOVERIES NEAR RAYLEIGH, ESSEX.

By FRANCIS W. READER.

Being the Report on an Investigation undertaken by the Morant Club.

With Five Plates and Ten other Illustrations.

[*Read 17th December*, 1910.]

THE discoveries which I am privileged to bring before your notice are of considerable interest as bearing on the existence of pre-historic man in Essex, and on some of the later physical changes that have taken place in the surface which he occupied.

These discoveries are due to the observation and energy of Mr. H. Rand, who, residing in the district where they occur, has had the sagacity to avail himself of the opportunities which lay in his path.

Mr. Rand lives near Rayleigh, and cultivates some land on the gravel-capped eminence known as Hamborough Hill (pronounced locally " Hambro' Hill ") where various objects have, from time to time, been found, and show that this site has been favourable for occupation and that various races of men have successively availed themselves of its advantageous position.

A more important and definite discovery is an ancient Neolithic " floor " buried in the mud which forms the bank of the River Crouch at Hullbridge. Mr. Rand's keen sporting instincts have led him to frequent the river, and during his fowling and fishing expeditions he has noticed the occurrence of a band of peat containing quantities of wood, bones, pottery, flint implements, burnt flints, etc. He has taken every

opportunity of collecting these objects and has been kind enough to lend the results of his labours for exhibition here to-night.

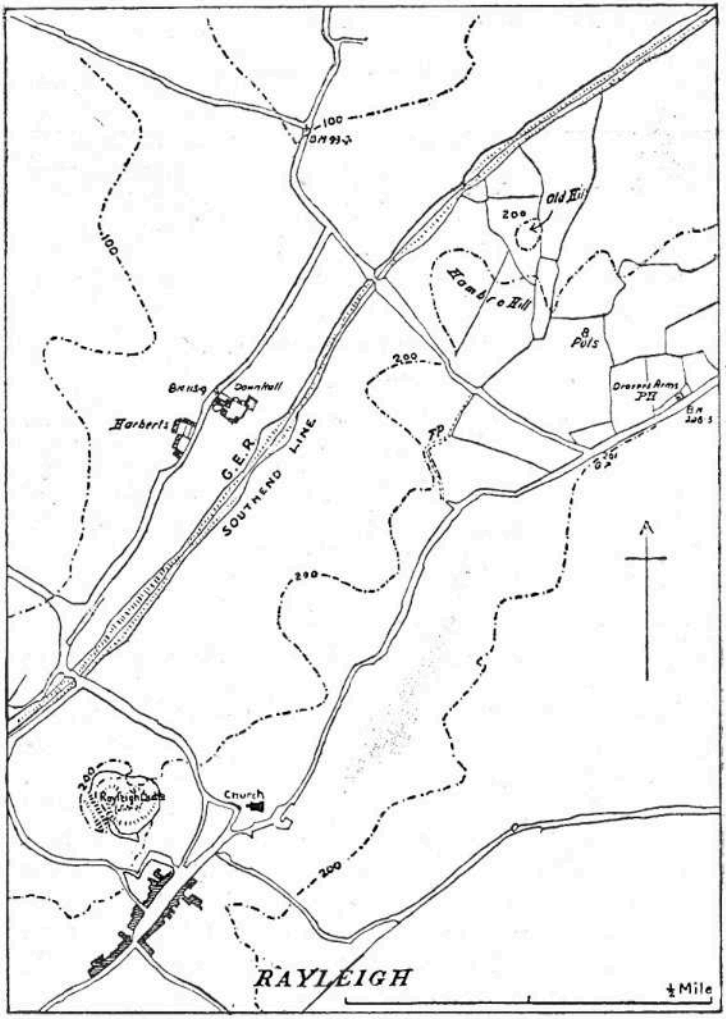


FIG. 1.—PLAN SHOWING THE POSITION OF HAMBOROUGH HILL AND RELICS.

After having these sites under his observation for a long period, he paid the Morant Club the compliment of inviting a

party of its members to inspect his discoveries, and he freely placed all the facts at the Club's disposal.

This visit took place on the 15th October last, and it proved to be of such interest that it was thought that a general account of what had been seen would be acceptable to the Essex Field Club.

This account, so far as I am concerned, must, however, be regarded merely as preliminary, and with a view to making these discoveries more widely known, so that others having leisure and opportunity may pursue the investigations further. Mr. Rand, with a true scientific instinct, cordially invites assistance from anyone who may be interested, and has no desire to keep either the localities secret, or their investigation to himself.

HAMBOROUGH HILL.

In the first case, I will deal with the site of Hamborough Hill, which is a ridge capped with gravels and Bagshot Sands, about a mile north of Rayleigh. (*Plan* FIG. 1.)

The whole of the top soil on a portion of this site is being dug out and removed by Mr. Rand, for use in his green-houses, and during this process a large number of flint-flakes and implements have been found (See *Plate XV.*). The implements are of the small description made from flakes, and comprise those known as scrapers, arrow-heads, borers, knives, gravers, etc. Many of these are very small and delicate, while some show on their upper surface a series of transverse flakings which have, at first sight, very much the appearance of elaborate secondary working. A closer inspection, however, shows that such work could not have been produced after the flake had been struck off.

Owing to the discovery elsewhere of clusters of similar flakes on a working floor, it has been possible to replace some of them, and by this means it becomes quite clear how this simulation to secondary working, which is often a very delicate ripple surface, came about. The method employed by the makers of this type of object was first to prepare the block of flint selected for operations by working off inequalities and producing an even surface by finely flaking it all over. After this was done the larger flakes were struck off, the more suitable being further manipulated for special purposes. Many of these flakes, simply

struck from the prepared core, were no doubt useful as scrapers and knives without any further treatment. They so closely resemble implements that have been secondarily worked as to have been frequently mistaken for them.

The replaced flakes, showing this method, here illustrated (Fig. 2) are from the collection of Mr. A. S. Kennard.

The larger types of implements are, at present, only represented by a portion of a polished axe, this being the cutting edge (FIG. 12, *Plate XV.*).

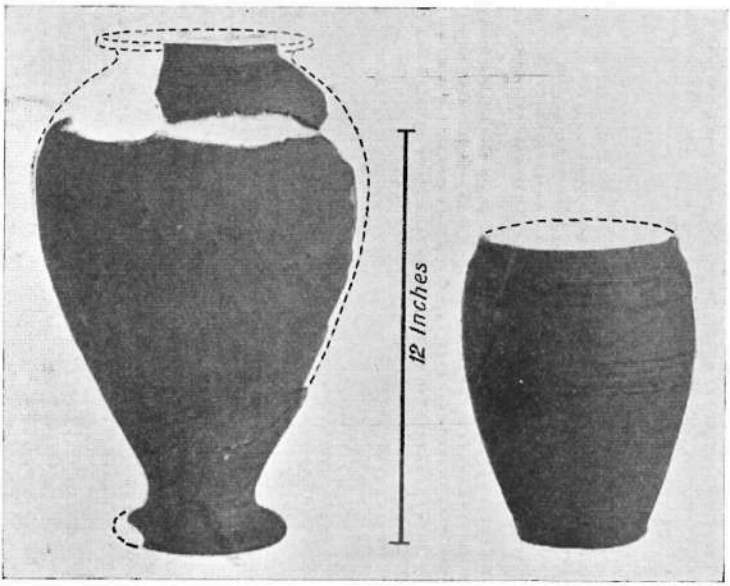
Our interest was aroused in a pit which Mr. Rand had discovered and kept open for our inspection. In the lower part was a layer of burnt earth and wood ashes, while several flint flakes occurred in the filling. This led us to hope that this find would have thrown some light on the earlier occupants of the hill, but on digging further into the fire-floor, we found some green glazed mediaeval pottery which showed the pit to have been of comparatively recent formation.

FIG. 2.—REPLACED FLAKES, SHOWING PRELIMINARY DRESSING.

An interesting find was made a few years ago, on the land adjoining that of Mr. Rand's, where a man digging for sand came across eight pots placed in a straight line. They were unfortunately thrown aside as valueless. Mr. Rand was able subsequently to recover portions of them, two of which are almost complete, and the base of a third is in the possession of Mr. Wright. These are of the late Celtic period and undoubtedly represent an interment, as Mr. Rand found calcined bones in the soil of the spot from whence the pots were taken. There were also many flint flakes, but these occur so generally, scattered in the soil, over the whole site, that they may be the relics of an earlier Neolithic settlement.

Mr. Rand has kindly supplied a photograph of the pottery

which is here reproduced (fig. 3). No. 1 is a pedestal urn of the Aylesford type, about 15 inches high. No. 2 is a barrel-shaped urn having two bands of cordons on the upper part. It is 8½ inches high. No. 3 (FIG. 4) is the base belonging to Mr. Wright which has been lathed underneath in the manner characteristic of the period. Mr. Rand will continue to keep this site under



1 2

FIG. 3—TWO OF EIGHT URNS FOUND DISPOSED IN A STRAIGHT LINE AT HAMBOROUGH HILL, NEAR RAYLEIGH.

observation and will report on any further finds that may occur.

There are several examples of similar form to No. 1, fig. 3., among the fine collection of Late-Celtic pottery in the Museum at Colchester[1], and one nearly resembling No. 2, fig. 3, but the specimen in the museum is a little more restricted at the mouth and has only one band of cordons. There is also one with a foot of the same general form as fig. 4, but Mr. A. G. Wright, of Colchester Museum, tells me that there is no example of a base turned in the same manner. Although it is a common characteristic for the base of Late-Celtic pots to be carefully lathed, they usually have one rounded moulding left on the edge, which is a commom type known as the "beaded base."

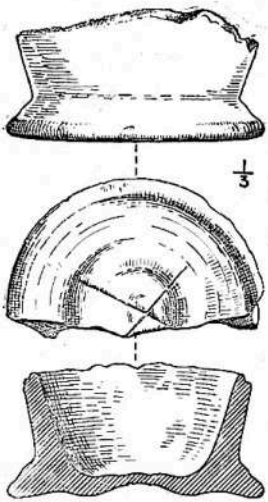
1 Colchester Museum Report, 1909. Plate III.

The specimen from Hamborough Hill has two somewhat heavy concentric rings, which is unusual.

DESCRIPTION OF PLATE XV.

Fig. 1. Leaf shaped arrow-head.
2. Flake worked to a point.
3. Tanged Arrow head.
4, 5, 7, and 10. Scrapers.
6 and 9. Knives.
8. Hollow scraper.
11 and 13. Pointed flakes or borers.
12. Portion of ground axe.

HULL-BRIDGE.



No. 3.
FIG. 4.—BASE OF POT FOUND AT HAMBOROUGH HILL.

We were next conducted to the more important site at Hull-bridge, a river-side village, on the south bank of the Crouch, about 3 miles to the north of Hamborough Hill. (See *Plan* FIG. 5.).

This investigation was a much more serious undertaking. In the first case, the deposit we had come to see was on the opposite side of the river and was exposed only at low water. Under these conditions, the river at this part is too shallow for a boat to be of any assistance. So there was no other recourse but to wade the stream. We were fortunate enough to be provided with wading boots, though even these did not entirely remove difficulties from the expedition.

The tidal clay of the Essex river estuaries is hardly an ideal material to walk on, even in wading boots, as occasionally it is found to be much easier to draw the leg from the boot than it is to extract the boot from the clay mud. The clay possesses the good quality, however, of being soft in the event of a fall. The centre of the river has a gravelly bottom and walking was comparatively easy, but on gaining the opposite bank our way lay along the sloping clay-mud, between the low-water channel and the salting. (FIGS. 6 and 7).

Although the salting is more or less covered by every high-tide, the edge of the salting forms practically the boundary of the high-water channel, and this has been eroded so as to leave a steep bank about five or six feet high. The bare mud slope between this and the low-water channel is known as the "cant," and it is at the top of this and the base of the eroded salting-edge that the layer of peat occurs. This deposit is about one foot in thickness, and shows prominently on account of its dark rich colour as compared with the light grey river-silt in which it has become buried, and owing also to the greater resistance

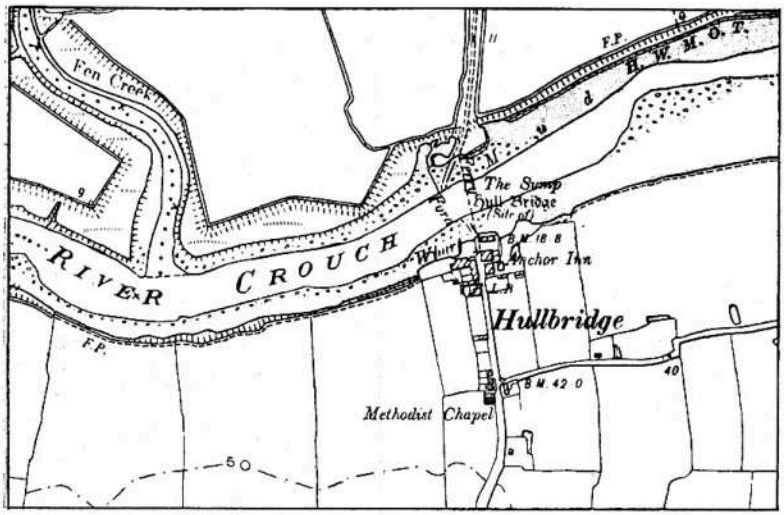
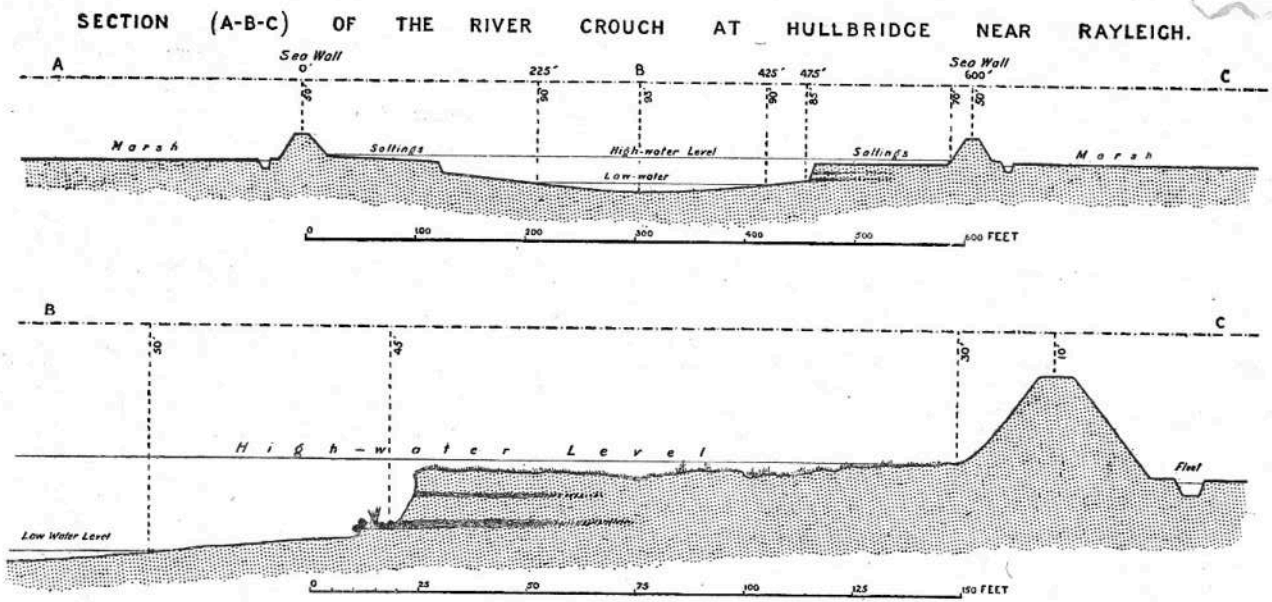


FIG. 5.—MAP OF HULLBRIDGE SITE.

which its tough substance offers to the wash of the tides. (*Plate XVI.*)

A considerable quantity of this deposit was exposed, although we were told that much of it had recently been washed away, owing to severe storms. In it were standing many pieces of wood, which on being dug out we found to be clearly the remains of the roots and lower stems of trees, which had been growing when the peat formed the surface. Many of these trees were silver birch, the white bark of which was excellently preserved. The most interesting feature was the number of well-formed flint-flakes, which lay about profusely, and also many burnt



FIGURES 6 and ~

flints or "pot-boilers," while occasionally patches of red-burnt earth occurred at various levels in the peat, marking the spots where fires had been lighted at different times while the peat was forming. We also found some fragments of rude hand-made pottery, similar to that which Mr. Rand had previously obtained from the site, and there were many animal bones.

All these indications formed abundant evidence of the peat having originally been a land surface out of reach of the tides, and one on which some band of early men had settled, making flint implements and cooking their food.

Unlikely as such a spot may seem for the occupation of man under the conditions at present prevailing, it is evident that this deposit now buried under at least six feet of tidal mud was once the surface, unwashed by salt-water, on which man was living in comparatively large numbers.

Overlaying this bed of peat is about three feet of tidal clay, when another band of peat-growth is visible. Again, this must have formed a later surface untouched by the tides, succeeding a considerable period of gradual submergence during which the three feet of tidal silt was deposited. This upper band of peat was only three or four inches in thickness and, so far, no relics have been discovered in it to give any clue to the age of its formation. Over this higher peat several feet more of clay mud has accumulated and forms the salting surface which exists to-day.

These phenomena represent breaks in the general downward earth movement during the time the most recent alluvium of the river has been accumulating.

If, as appears, judging superficially, the lower peat rests on tidal silt, we must conclude that the river of this part was estuarine before the formation of the lower peat. Such alternate deposits of tidal silt and peat would suggest subsidence followed by emergence, this process being repeated to form the upper peat, and being in turn succeeded by subsidence to the present condition of things.

Similar layers of peat are found in the recent alluvium of the Thames, and have also occurred in many of the East Anglian rivers. Some of these are probably the result of special and local causes, such as the shifting of the stream in its bed, or some temporary obstruction such as fallen trees swept together

after a storm, or a dam constructed by beavers, or sandbanks forming across the river's mouth. Causes such as these have been known to effect wide-spread alteration over large tracts of country, and caution should, no doubt, be exercised in looking to more powerful natural agencies to account for slight recent changes.

Many of these river deposits, however, occur in such regularity over a considerable area, that they seem to mark some general succession of events, dating from the Neolithic period. This represents a time of long duration and of momentous development, so far as man's history is concerned, although geologically such a lapse of time is quite insignificant, and any changes that have occurred are too slight to be regarded save as mere incidents during an almost stationary geological condition.

Archæological evidence is more likely to record such slight changes in prominent relief and to supply us with data for gauging with greater accuracy the extent to which changes in the physical condition have occurred in recent geological times.

Any discovery serving to throw light on this question becomes important, and a comparison should be made with similar occurrences elsewhere.

Much valuable information regarding the peat deposits of the Thames has been collected by Mr. Whitaker,[2] and Mr. F. C. J. Spurrell[3] has contributed some important papers on the subject, in which he has, more than anyone else, dealt with the archæological side of the question. In the general section of the course of the Thames, Mr. Spurrell shows that three distinct bands of peat are found in the bed of the river at Gravesend. The lowest of these dies out in ascending the river, so that at Crossness two only are found, while only one is found at London and the higher reaches beyond. (Fig. 8).

Mr. Spurrell has obtained a great deal of evidence that the highest of these bands was a land surface in Roman times. Describing the section at Tilbury, he says :—

" The upper layer of the peat was comparatively thin and mainly consisted of a small growth of underwood, with spreads of grass resembling the growth on the marshes of the present day. I think it likely that

2. *Memoirs of the Geological Survey*, 1889. Vol. 1. *Geology of London*, p. 454, etc.

3. *Arch. Journal*, vol. xlii. 1885 "Early Sites and Embankments on the Thames Estuary"; *Proc. Geol. Assoc.*, vol. xi. 1889-90. "On the Estuary of the Thames and its Alluvium," pp. 210-230; See also: T. V. Holmes, *Trans. Essex Field Club*, vol. iv., p. 135, and B. B. Woodward, *Proc. Geol. Assoc.*, vol. xi., No. 8.

this layer was much thinned in places in consequence of drought and by the rotting of the surface, due to clearing or agriculture, for on this level the Romans lived."

"I found the remains of a building in one place, surrounded by the rubbish remaining from a lengthy occupation."

Later he learned that, "Roman relics were found over the whole area uncovered by the dock excavation and many were of such excellence that some of the men were enabled to make a goodly harvest by their sale in London."

A considerable deposit of peat has been found in the filling of the streams flowing into the Thames at London, and particularly in the Walbrook.[4] This stream, in early Roman times, had a clear, swift current flowing over a gravelly base. The early Romans settled on its banks and formed structures on piles in its bed, where various industrial pursuits were carried on with the advantages offered by a good stream of water.

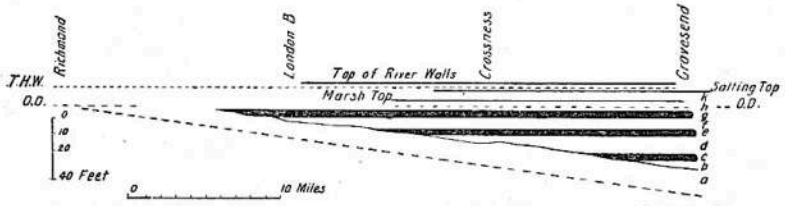


FIG. 8.—MR. SPURRELL'S DIAGRAM OF THE THAMES ALLUVIUM SHOWING THE PEAT BEDS.

The Romans built their city wall across the bed of this stream at Moorfields, and were careful to make provision for the passage of the water by means of culverts During a later period of the Roman occupation (probably in the 3rd century), the stream became a sluggish quagmire and the bed filled with peaty mud The culverts became choked and the hollow of Moorfields was filled with a swamp which soaked under the city wall and spread over a large part of Londinium. Although much of the city was reclaimed from the swamp during later Roman times, the Walbrook never regained its former condition, but continued to accumulate peaty mud until late in the Middle Ages, when its restricted channel was arched over and buried underground.

As far inland as Braintree, two bands of peat are found in

4 *Arch. Jour.* lx., pp. 137-235. *Archaeologia*, Vol. lx., pp. 169-148.

the filling of the little stream known as the Pod's Brook.[5] In the upper of these deposits, occurred the Early Iron Age objects of the supposed Pile-dwelling site, which the Rev. J. W. Kenworthy has fully described.[6] No objects of human agency were discovered in the lower band of peat, but its position would make the Neolithic period a very probable one for its formation.

There are many striking proofs of altered physical conditions on the Essex Coast, though the evidence of changes brought about by recent subsidence is, perhaps, not very conclusive.

The excavations carried out during the last few years in the Red Hills[7] show that these mounds, which date from one or two centuries before the coming of the Romans, were formed on ground which was tide-washed. Distinct seams of tidal silt occur in the red earth, clearly showing that the tide came over

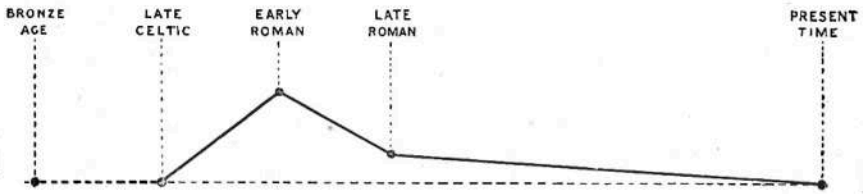


FIG. 9.—DIAGRAM SHOWING THE SUPPOSED ALTERATION OF SURFACE LEVEL.

them during their formation. Most of the Red Hills are now enclosed by the sea walls, and it is computed that, owing to the shrinkage of the land through enclosure, their level is several feet lower than it was originally.

In spite of this, and the supposed subsidence of the coast, it seems very doubtful whether the Red Hills at the present time are below the level of the tides. In fact, some of them that have been left on the open saltings remain high and dry, save, perhaps, for quite exceptional tides. Lines of "settlings," round their base mark the limits of ordinary tides, while the general area of the mound is grown with fresh grass, and in some instances they bear ancient stetch-marks, showing that they are sufficiently out of the reach of the salt-water to have been cultivated.

5 ESSEX NATURALIST. Vol. xiv., pp. 137-147.
6 ESSEX NATURALIST. Vol xi., pp. 94-126.
7 *Proc. Soc. Antiquaries*, 2nd Ser., vol. xxii., pp. 164-215; 2nd Ser., vol. xxiii. pp. 66-97.

There is, nevertheless, evidence that land which was occupied at some time during the Roman period is now buried in river mud, or covered by the sea, as is shown by Mr. Dalton in his recent paper, together with notes by Dr. Laver.[8] Portions of towns like Othona are washed away; the extensive site of the Upchurch potteries is now covered by the sea at every high-tide; the foundations of Roman buildings at Southwark lie many feet under ground, covered with a deposit of tidal mud. Roman sepulchral remains are found in several of the Kentish marshes, which are now regularly inundated, and also in the gravel of Moorfields, buried under many feet of black peaty mud.

On the other hand the Roman port, Rutupiae (Richborough), is now far inland, while at other points there are no indications that any appreciable change of level has taken place.

Tidal action and slight local earth movements may be held to explain these seeming inconsistencies, but I venture to think the evidence points also to some change of far-reaching extent, during Roman times, but not one wholly of subsidence. It seems probable that one of those breaks in the general lowering movement occurred at this period, and that about the time of the coming of the Romans a slight elevation of the east-coast took place. This, after an interval, was followed by subsidence, which has continued, though apparently at a slower rate of progression, to the present time. (See Fig. 9.)

Mr. Hazzledine Warren[9] tells me that he has noticed indications, on the Lincolnshire coast, of a depression of the land, which "suggest that considerable inroads of the sea upon the marsh lands took place about the middle of the Roman occupation. These inroads may well have been caused by some slight subsidence."

There are many evidences of a like phenomenon on the Essex Coast and the Thames district. Unless this subsidence were preceded by a movement in the opposite direction, we have to suppose so great a fall in the level as to be in conflict with other evidence, while such an alteration, as I have suggested, would not necessarily imply that the level at the present time, is much changed since the latter part of the Roman period. The marked changes having taken place during the earlier portion of the

8. Essex Naturalist. Vol. xvi., pp. 96-101. "Subsidence of Eastern England and adjacent areas."

9 See Essex Naturalist. Vol. xvi., 100.

Roman occupation, the conditions have reverted to much about the same as those which maintained in late Celtic times, when the Red Hills were formed.

Further examination of such deposits as those at Hullbridge may do much to throw light on many important questions relating to our early history, which are at present surrounded with doubt and uncertainty, and regarding which the evidence appears to be so contradictory.

Notes on the Relics from Hullbridge.

Although some of the objects from Hullbridge have been found in the silt, there is little doubt that most of them came originally from the peat, having been washed out by the tides.

The chipped axe-head (Fig. 1, plate XVII.) is an instance of this, it having been found in the mud on the "cant," but from the workmanship and the nature of the flint, there seems little reason to doubt that its origin is the same as that of the implements found in the peat.

It is, of course, probable that relics found in a peat-bed of such thickness may represent a long period of time and be capable of sub-division according to their position either in the base or at the top of the deposit. On the same grounds, it might be questioned whether the pottery is of the same age as the flints, or whether it is later. In the absence of any strict observation as to the position of the relics, it is not possible to say anything definite on this point, but judging from the character of the implements, they may all belong to the same period. They bear the same bold flaking from fresh, black flint, which would seem to have been brought from elsewhere. That the implements were made on the spot seems certain from the number of flakes and cores that appeared in profusion throughout the peat. Pot-boilers and patches of burnt earth, marking the position of fires, also occurred at various levels in the deposit.

All the implements, that have so far been found, are quite consistent with the Neolithic period. There is an absence of the generally recognised arrow-heads or later types of implements. No instance of a polished implement has occurred, although some have been found lower down the river, in the mud of its bed.

In addition to the chipped axe, already referred to, others of a rougher description have been found. There are also many tools made from flakes, of which some characteristic examples are shown on Plate XVII. No. 2 is a chisel, 3 an awl or borer, 4 and 6 scrapers, and 5 a knife.

The double hollow-scraper (4) is an interesting and uncommon form. The hollows at the sides may probably have served in securing the object in a handle of bone or wood, but it is also possible that these hollows were of more functional importance, as frequently scrapers and flakes are found with one such hollow only (Plate XV., No. 8), and similar objects have been used by the American Indians, as a kind of spoke-shave for smoothing the stems of arrows.

Mr. H. S. Toms, of the Brighton Museum, figures a double hollow-

scraper of this type[10], but in which the lower portion, including the bulb of percussion, is nearly twice as wide as the spoon end. This would be an impracticable shape for hafting, and it may be, as Mr. Toms supposes, that the hollows were the functional parts of the implement. Another scraper of small size and beautiful workmanship is figured (Plate XVIII. *f*), also a neatly made saw (*g*), and two delicately chipped knives (*d* and *e*).

Although none of the developed forms of arrow heads have been found at Hullbridge, there are many small pointed objects which may have served this purpose, such as (*a*) and (*b*), Plate XVIII.

It is interesting to note that a number of beautifully worked "pigmies" have been found by Mr. Rand. (Plate XVIII., *c*). They are more usually found in isolated groups, and it is rarely that these little objects have been discovered on a living site, associated with larger implements. Mr. Toms records a similar find near Brighton[11], and remarks on the absence of objects bearing a high standard of flint chipping being associated with them. This is quite in agreement with what is found at Hullbridge. The more finely worked arrowheads and knives, such as are found in the Bronze age barrows, do not occur, and "pigmy-flints" are generally regarded as belonging to the late Neolithic period.

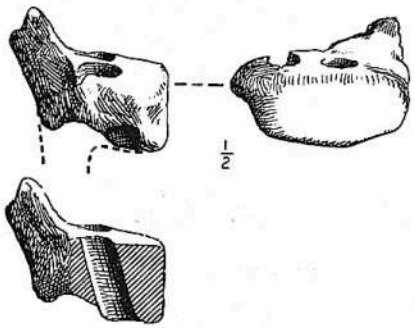


FIG. 10.—POTTERY LUG, WITH VERTICAL SUSPENSION HOLES, FROM HULLBRIDGE.

Turning to the *Pottery*, we have a somewhat more difficult problem, and doubt has been expressed as to its being of the same age as the flints. Neolithic pottery is of rare occurrence in this country, and some that has been found in the tumuli is very different in character.

The pottery from Hullbridge is of a most primitive description, being crudely made by hand and having distinct signs that it had been used for cooking, while except for a few finger-nail marks on the rims, it is quite devoid of ornament. Examples are shown in Plate XIX. It is rather difficult to find any parallel to it among the British pre-historic pottery, but it has some resemblance to that found associated with the Neolithic objects discovered at Ehenside Tarn, Cumberland[12], now in the British Museum. It is, perhaps, more closely like some of the pottery from the Swiss Lake-Dwellings and the Neolithic sites of France. There is one fragment among those from Hullbridge which particularly points to a

10 Some Prehistoric Camping Grounds near Brighton. *Proc. Brighton and Hove Nat. Hist. and Phil. Soc.*, 1902.

11 Pigmy Flint Instruments. *Proc. Brighton and Hove Nat. Hist. and Phil. Soc.*, 1907.

12 *Archaeologia*, vol. XLIV., pp. 273-292.

connection with the people of these districts, and that is the lug pierced with vertical holes (fig. 10). This feature, while common to districts of France and occurring in the Swiss Lake-Dwelling[13], is rarely found in this country and, so far as I know, has not previously been found associated with remains of the Stone-Age. A few instances of this peculiarity occur on the British Bronze Age urns, but in almost all cases the holes for suspension are made horizontally. There is a small and exceptional group having vertical holes, from Wilts and Dorset, which are in the British Museum. Instances also have occurred in Cornwall, and recently a Bronze Age urn, with lugs pierced with two vertical holes, was found in digging an ancient settlement at Leigh Hill, Cobham, Surrey[14].

Dr. Otto Tischler discovered two urns with this characteristic, in a tumulus in East Prussia, associated with bronze objects of the late Hallstatt or early La Tène period, and he remarks that it is a very unusual occurrence at so late a period, as this feature is one which marks the end of the Neolithic age.[15]

Much information on this subject has been collected by Dr. A. Guébhard in his paper "Sur les anses multiforées à trous de suspension verticaux."[16] In this, Dr. Guébhard gives many examples, mostly from sites of the Neolithic period.

There is, therefore, some reason for regarding the relics from Hullbridge as all belonging to the same period and that seems, with great probability, to be the latter part of the Later Stone Age.

BONES FROM THE PEAT DEPOSIT AT HULLBRIDGE. IDENTIFICATION AND NOTES BY MARTIN A. C. HINTON.

Equus sp. Left os innominatum.
Agrees in form and size with that of a Spanish Ass. Referable to pony or donkey.

Cervus dama. Part of shed antler.
Agreeing in curvature with the antler of the Fallow Deer and therefore provisionally referred to this species.

13 *Lake Dwellings of Europe*, Nos. 16 and 17, Fig. 24, p. 115.

14 *Surrey Archaeological Collections*, vol. XXII. pl. 1. The exploration of this site at Leigh Hill has produced a most interesting collection of pottery fragments, marking the period of transition from the Bronze Age to the Early Iron Age, down to about the time of the coming of the Romans. With the exception of the similar find at Shoebury, which is now in Colchester Museum, perhaps no more instructive discovery of pottery has been made. Owing principally to the zeal and enthusiasm of Mr. Frank E. Spiers and Lieut.-Col. Gordon Clark, this collection has fortunately been preserved intact, under the charge of the Surrey Arch. Soc., in the Guildford Museum. It should receive careful attention from all those interested in the pre-Roman pottery of this country.

15 *Ostpreussische Grabhügel II. Schriften der phys.-ökon Gesellsch. zu Königsberg XXIX, 1888.*

16 *Congrès Prehistorique de France.* IVe. Session (Chambery, 1908) pp. 737-768.

ON THE CORRELATION OF THE PREHISTORIC "FLOOR" AT HULLBRIDGE WITH SIMILAR BEDS ELSEWHERE.

BY S. HAZZLEDINE WARREN, F.G.S.

Being a Morant Club Report presented to the Essex Field Club on 17th December, 1910.

I.—THE HULLBRIDGE SITE.

THE visit of certain members of the Morant Club to Rayleigh and Hullbridge on the sixteenth of October last has been described in the previous paper by Mr. F. W. Reader. I was fortunate in being a member of that party, and consequently had an opportunity of examining the prehistoric sites recently discovered by Mr. Rand, of Rayleigh. The present paper is concerned with one of these sites only, namely that at Hullbridge, and with a comparison of this site with similar ones which have been discovered elsewhere.

A considerable number of worked flints were found on this site by various members of the expedition. My own "bag" on this occasion amounted to seventy-two worked flints. These consisted chiefly of flakes and cores, and did not include anything of a noteworthy character. A large proportion of these were found in place, in the section of the "floor" exposed on the mud banks of the river, and all had undoubtedly come from that site. The general character of this "floor" has been admirably described by Mr. Reader, in the paper already referred to. I need only say here that this pre-historic floor, or working site, is situated on an ancient surface, now deeply buried beneath accumulations of tidal silt. It is the actual surface on which the users of the stone implements lived, although it is now at a level which is only a very few feet above low-water mark.

The buried surface was seen to occur beneath a bed of peat, or peaty clay. Mr. Rand reports that he has since found the stump of a tree, in the natural position of life, on the level of the peat, but although wood was abundant, we did not see this on the occasion of our visit. The exposures seen in the banks of these tidal channels continually vary, according to the direction of the prevailing wind; some places, previously exposed, becoming deeply buried under fresh accumulations of silt, others, previously hidden, becoming swept clean from all recently deposited mud.

II.—THE BURIED PREHISTORIC SURFACE AND THE SUBMERGED FORESTS.

A prehistoric surface buried beneath the marsh lands, with an associated peat, is widely distributed not only in Essex, but also in Lincolnshire, Somersetshire, and elsewhere. It is not infrequently accompanied by a forest growth, and it then forms the familiar "submerged forests" of our coasts. The forest, however, is not always present, and is in no way an essential part of the phenomenon. It is very commonly seen at a level of about two to five feet above low water mark, but it passes out of sight below this line, descending to the deeper parts of the submerged river valleys.

To what depth the surface inhabited by prehistoric man may thus descend, I have not been able to ascertain positively. The deep excavations for the docks at Barry in South Wales[1] and at Grimsby[2] have brought to light peat beds at depths of fifty or fifty-five feet below high water mark, and at forty feet below high water mark at Liverpool,[3] but no evidence of human occupation has yet been obtained from these depths. It is not improbable that it may yet be found.

The lowest recorded depth at which any prehistoric remains have been found comes from the Southampton Docks.[4] These were found in a thick bed of peat filling up an old river channel, and not in the more usual position of the former dry land surface beneath the peat. These remains consist of flint flakes, and a perforated stone hammer. The latter is stated to have been found near the bottom of the peat, at a depth of about twenty feet from the surface [which is presumably the salting surface] but the conditions under which it was found are not quite clear to me, and it does not appear to have been found in place by a scientific observer. But even taking this depth as strictly reliable, it is not much below the surface as seen on the shore at the lowest tides.

It has already been stated that the usual position in which prehistoric remains are found associated with the submerged forests is on the former dry land surface beneath the peat

1 A. Strahan, *Quart. Journ. Geol. Soc.*, vol. lii. (1896), p. 474.

2 S. V. Wood, jun., and Rev. J. L. Rowe, *Quart. Journ. Geol. Soc.*, vol. xxiv. (1868), p. 157.

3 T. Mellard Reade, *Proc. Liverpool Geol. Soc.* (1871-2), p. 36.

4 T. W. Shore and J. W. Elves, *Papers and Proc. Hants Field Club*, vol. i. (1889), p. 43.

as exposed between tide marks on the shore of marsh lands, or in the silted-up estuaries of rivers. Such remains have been found in this situation by the writer at Ingoldmells Point in East Lincolnshire.[5] They have also been recorded from both Porlock and Minehead in West Somerset,[6] where Dr. Boyd Dawkins found flint flakes on the old land surface upon digging through the overlying peat. Kitchen-midden debris consisting of the shells of edible marine molluscs and bones split for the marrow, together with flakes and cores of flint, have been discovered in Barnstaple Bay. In the earlier description[7] this was stated to have been found in the peat of the submerged forest. Later work has shown that these prehistoric remains really occur on the old dry land surface formed by the "Head" and beneath the peat.[8] Mr. T. Rogers has found two series of implements at Westward Ho, in this district, the one series beneath the peat exposed low down on the shore, and the other series in a bed of clay seen at just below high water mark and close to the pebble-ridge.[9] From the fact of their higher position, Mr. Rogers infers that those from the clay are the later of the two. This might almost be a description of our two series of Eastern Essex, except that in Essex it is possible to trace the junction between the two beds, when it is found that the apparently higher clay (rainwash) with its implements passes under and is overlaid by the buried prehistoric surface beneath the peat. At the Barry Docks section in South Wales,[10] a fragment of a polished stone axe was found at the bottom of the upper peat bed, situated at a level of four feet below the Ordnance Datum line. This again appears to correspond with our buried prehistoric surface of Essex. In Whitesand Bay (Pembrokeshire), Dr. H. Hicks refers to having found a well-worked flint flake in the submerged forest, associated with the remains of the Red Deer and the Brown Bear.[11]

Earlier discoveries in the submerged forests of Cornwall, exposed during stream tin workings, have also been recorded.

5 S. H. Warren, *Man* (published by the Anthropological Institute) (1907), 89.
6 W. Boyd Dawkins, *Early Man in Britain* (1880), p. 249.
7 H. S. Ellis, *International Cong. Prehist. Arch.*, 3rd session (1868), p. 89. Townshend M. Hall, *Quart. Journ. Geol Soc.*, vol. xxxv. (1879), Proc., p. 106.
8 T. Rogers. *Trans. Devon Assoc.*, vol. xl. (1908), p. 248.
9 T. Young. *Trans. Devon Assoc.*, vol. xxxviii. (1906), p. 267.
10 A Strahan, *Quart. Jour. Geol. Soc.*, vol. lii. (1896), p. 474.
11 H. Hicks. *Quart. Jour. Geol Soc.* vol. lii. (1896), p. 489.

These consist of human remains (skulls), trees cut with an axe, and other evidences of the presence of man.[12] Further in the North, on the Cheshire coast, large numbers of flint implements are reported to have been found on the shore of the peninsula of Wirral.[13] These have been washed out of a submerged surface, but I have not examined the locality myself; nor have I been able to obtain definite information about them. A human skeleton has been found near Leasowe Castle, in the same district, in marine clay, underlying the Upper Peat of the Lancashire and Cheshire coast.[14] This Upper Peat may be situated approximately upon the horizon of the "Lyonesse" surface, presently to be defined, but I have no evidence, beyond the general similarity of its position, that this is so. The question is worth further consideration, as its solution would elucidate the relative ages of the Leasowe and Walton-on-Naze skeletons; the latter was described in a preceding paper (*ante* pp. 198-208).

In the Isle of Man, human bones have been found in the submerged forest in the Bay by Carrickey.[15] Earlier discoveries have been made at the same place, including the foundations of a primitive hut, containing "some antique uncouth-looking instruments, conjectured to have been the property of primitive wood-cutters."[16] On the former dry land surface beneath the inland peat of the Island, stone axe-heads have also been found.[17] In the North of Ireland, on the other hand, there is evidence of elevation since the prehistoric age, but it is not my purpose to enter further into discoveries so far afield as this.

On the East coast, besides my own discoveries at Ingoldmells Point, many flint chips and other evidences of the presence of man have been found associated with the peat exposed at low tide in the banks of the Humber at Merton.[18]

I might also refer to the discovery, made by the Rev.

12 E. Smith, *Trans Geol. Soc.*, vol. iv. (First Series) 1817, p. 404; W. J. Henwood *Trans. Roy. Geol. Soc., Cornwall*, vol. iv. 1832, p. 58; J. W. Colenso, *ib.* vol. iv. 1832, p. 29 These papers have been quoted by De la Beche in the "Report on the Geology of Cornwall" 1839, p. 406; and also in more recent Memoirs of the Geological Survey, but no new information is given as the stream tin works have long been closed.

13 C. E. de Rance *Superficial Geology of South-West Lancashire*, Mem. Geol. Survey, 1877, p. 94

14 T. Mellard Reade, *Proc. Liverpool Geol Soc.* 1871-2, p. 36; G. Busk, *Proc Ethnol Soc.*, vol. iv., New Series 1866, p. 101.

15 J. M. Jeffcott, *Yn Lioar Manninagh* (*Isle of Man Nat. Hist. and Antiq. Soc.*), vol. i., 1889, p. 56.

16 Maccullock and J. S Henslow *Quart. Journ. Geol. Soc*, vol. ii., 1846, p. 344.

17 J. G. Cumming. *The Isle of Man*, 1848, p. 216.

18 J. R. Dakyns, C. Fox-Strangways, and A. C. G. Cameron, *Geology of the Country between York and Hull*. Mem. Geol. Surv. 1886, p. 38.

G. Mumford in 1831, of a flint axe found buried to a depth of 1½ inches from its cutting edge, in one of the trunks of the trees in the submerged forest near Hunstanton, in Norfolk.[19] As possibly belonging to the same horizon, a chipped flint axe with a ground edge was found embedded in the frontal bone of the skull of *Bos primigenius* at the bottom of the peat in Burwell Fenn, Cambridgeshire. Nearly the whole skeleton of the animal, which was a fine example of its species, was found, and it had clearly been killed by the axe, which had penetrated the brain. The flint axe was itself broken across, a little way from where it would have entered the handle, probably by the force of the blow.[20]

As is well known to all collectors of prehistoric remains, large numbers of stone implements have been dredged from the bed of the Thames.[21] These may possibly have come from some buried surface, but so far as I am aware, they have never been traced to their source.

Discoveries having an important bearing upon a problem presently to be considered, namely the age of the Buried Prehistoric surface, have likewise been made in Torbay. Here Mr. D. Pidgeon has found, upon the former surface beneath the peat, the sites of several hearths, associated with flint implements, primitive pottery, granite grinding stones about ten inches in diameter, ingots of copper, and material which, upon analysis, proved to be tin slag.[22]

This evidence of primitive bronze smelting accords well with the fragments of "Beaker" or "Drinking Cup" pottery from Eastern Essex. It also accords with the general types of the stone implements of the Later Series of East Essex, with the perforated stone hammer from the Southampton Docks, with the chert knife from Torbay, which is preserved in the Museum at Torquay, and with other finds in the ancient buried surface. All these are such as are found associated with early bronze. This is a subject to which we shall return in the sequel, when considering the problem of the age of the Buried Prehistoric Surface.

19 Gunn, *Geology of Norfolk* (1883), p. 22. See also W. Whittaker and A. J. Jukes-Browne, *Geology of the Borders of the Wash*, Mem. Geol. Survey 1899, p. 101.

20 J. Carter, *Geol. Mag.* (1874), p. 492.

21 F. C. J. Spurrell, *Proc. Geol. Assoc.*, vol. xi. (1889), p. 210.

22 D. Pidgeon, *Quart. Journ. Geol. Soc.*, vol. xli. (1885), p. 9.

Thus the archæological evidence is at least not contradictory to the idea that this ancient surface belongs to a definite horizon all round the southern parts of Britain.

At the same time, some caution is undoubtedly needed here. For, although, in my opinion, the commonest submerged forest of our coasts belongs to this definite stage, yet it must not be forgotten that there are many other peats with associated forest growths, which belong to very different horizons, some dating from the age of the Mammoth, others coming down to much later times. In order to give it a definite name to distinguish it from the other surfaces, I propose, for reasons presently to be given, that the Buried Prehistoric Surface should be called the "Lyonesse" surface.

III.—THE EVIDENCE OF SUBMERGENCE.

Some writers[23] have endeavoured to explain the "submerged forests," without calling in any change in level, by supposing that the forests grew on low-lying land protected behind sand banks, and that when these gave way the forests became submerged. Or else, upon another theory, that the soil underlying the peat and forest beds has been eroded by the passage of subterranean water so as to cause the peats to founder down and appear to occupy a lower position than that to which they actually belong.[24]

If either of these theories were substantiated, it would be impossible to attempt to correlate the buried surfaces of different localities with each other. The phenomenon of the submerged forests would be one of local accident only, and they might be —indeed, would be—of different ages at different places.

If, on the other hand, the submerged forests be due to a general and wide-spread submergence of the country, then it may be possible to correlate the ancient surfaces, as seen at different places, with each other. The archæological evidence points to the conclusion that the buried surfaces in East Essex and in Devonshire, which are on about the same level, were also submerged at approximately the same date. Then, if the submergence was a general one, it is a fair presumption to assume that other surfaces at the same levels, which are seen at inter-

23 Professor Suess is the foremost exponent of these views, but they have also been advocated by many other writers.

24 W. Shone, *Quart. Journ. Geol. Soc.* vol. xlviii. (1892), p. 96.

mediate places, were also submerged at about the same time, And further, it may be remarked that if, as appears to be the case, this submergence was a considerable one, it is not likely that local accidents (such as the protection afforded by sand-banks) would modify by any considerable period of time the date of submergence of the same level at different places. The greatest chance of such local interference with the general phenomenon would undoubtedly be found at places situated at the heads of the estuaries which were the farthest from the open sea-board.

It certainly appears to me that the theory of local accident is inadequate to account for the position of the submerged forests. Apart from the difficulty of explaining the existence of peat beds, intercalated between fresh-water silts, at depths of fifty feet or more below sea level, there is also the physical evidence of the submerged river channels, the "drowned valleys" of American geologists, to be taken into account. The submerged forests in general, and the Buried Prehistoric ["Lyonesse"] surface in particular, are intimately associated with the deep river channels. These deep channels were certainly excavated at a time when the land stood at a much higher elevation relatively to the sea than it does to-day. The series of prehistoric deposits often form an integral part of the former marsh beds of these river valleys; and these deep river valleys have most unquestionably been submerged.

The level of the Buried Prehistoric Surface is too low, and it is too widely spread and continuous in its distribution to be explicable without inferring a considerable change in level.[25] In fact, I think there can be no doubt that it forms, broadly speaking, a well-defined horizon, and represents a definite event in the recent geological history of the country.

IV.—THE SUCCESSION OF RECENT DEPOSITS IN EAST ESSEX AND THE PREHISTORIC REMAINS THEY CONTAIN.

In a previous communication to this Society I gave some account of the conclusions at which I had arrived from an examination of the marsh deposits of Eastern Essex.[26] In this

25 Sir A. Geikie, *Quart. Jour. Geol. Soc.*, vol. lx. (1904), Proc., p. xcviii.

26 S. H. Warren, "Notes on the Palæolithic and Neolithic Implements of East Essex," *Essex Naturalist*, vol. xvi. (1908), p. 46.

district, I have minutely examined some twenty-five or thirty miles of sections, at frequent intervals, during a period of six years. This work has enabled me to amplify the details previously given in several respects. As I must necessarily refer to this district as a standard of comparison, it will be well to give the full details here.

9. Present salting surface.
8. Tidal-silt, or *Scrobicularia*-clay, with Red-Hill briquetage.
7. Peat.
6. Buried Prehistoric surface with Flint Implements and Pottery [the "Lyonesse" surface].
5. Grey Marsh Clay.
4. Rainwash with Flint Implements and Pottery.
3. Pleistocene (?) Brickearth, containing occasional erratics.
2. Layer of shattered septaria
1. Grey Marsh Clay with *Elephas primigenius*.
0. London-clay.

It must be understood that this full succession is not seen in its completeness at any one point. Like all geological successions, whether on a large scale or on a small one, it must be pieced together from evidences that are somewhat scattered and fragmentary.

The pieces of Red-Hill briquetage that were found *in situ* in the *Scrobicularia*-clay (No. 8) were lying in its upper part, not far from the margin of the marsh, at a spot where the Buried Prehistoric Surface was rising up to the side slope of the valley and the *Scrobicularia*-clay only about two feet six inches or three feet in thickness. It is therefore a little uncertain to what level in that clay it might belong in the more central parts of the channels. I think it most probable that it would still belong to the upper part.

The Rainwash (No. 4) is found chiefly at or near the foot of the valley slopes, it is not so much seen in the more central parts of the channels. The Grey Marsh Clay (No. 5) seems to succeed the Rainwash horizontally, in going towards the central parts of the channels, and as it is probably contemporary with the Rainwash, the two are bracketed together in the table. I have not succeeded in finding any remains in this bed. Still further towards the centre of the channels, at least so far as the Hamford Water is concerned, both these beds, and also the Pleistocene (?) Brickearth below, are cut out, and the Buried Prehistoric Surface rests directly on the line of shattered septaria.

This line of shattered septaria probably represents the bottom of the former river channel, and is the product of the erosion of the London clay. At certain spots, marine shells are associated with this bed, and I at one time thought that it must be marine. I have come to the conclusion, however, that the explanation is simply this, namely, that during the submergence of the ancient surface a certain amount of marine erosion took place before the deposition of the Tidal Silt (No. 8), so that the intervening beds (Nos. 3 to 7) were completely eroded away at certain spots, and marine shells lived among the broken septaria

At one spot on the tidal mud flats I found last August a fine example of the last lower molar of *Elephas primigenius in situ* in grey marsh-clay. Unfortunately the exposure was a very small one, and, being surrounded on all sides by the modern sea sand, its relations to the other beds were somewhat obscure. The only clue obtainable was that it was underneath a layer of shattered septaria. As this line is so persistent, I feel little doubt that this is its right position, and that the marsh clay in which the mammoth molar was embedded was a fragment of a late Pleistocene marsh. This was some miles north of the celebrated mammoth bed of Walton-on-Naze, with which it may probably be correlated. The mammoth remains also, which are dredged from such situations as the Dogger Bank, the bed of the Thames, and Torbay, doubtless come from similar late Pleistocene marsh beds.

These facts are an illustration of the impossibility of inferring the date of one of these deposits from its level alone, without working at the details of the local succession. Coming somewhat into line with these low level Late Pleistocene deposits, I have also recently found a Late Pleistocene marsh surface on the floor of the Lea Valley, in the gravels which pass under the Alluvium.[27]

In the previous paper on this subject[28] the prehistoric remains from the Rainwash (No. 4) were spoken of as the Earlier Series, while these from the Buried Prehistoric Surface were referred to as the Later Series. In that paper certain differences in the technique of the flint working in the two series were illustrated. The chief point in which subsequent work has shown the need

27 S. H. Warren, *Nature*, December 15 (1910). "Arctic Plants from the valley-gravels of the River Lea."

28 S. H. Warren, *Essex Naturalist*, vol. xvi. (1908). p. 46.

for correction is in reference to the barbed arrow-points. In illustration of the former paper, a barbed-arrow point was figured (ESSEX NATURALIST, vol. xvi., 1908. Pl. iv. fig. 2), of which it was remarked that: "It is a little uncertain to which of the two series this should be referred." This specimen was found associated with the Earlier Series, but, as it is generally held in prehistoric archæology that the barbed flint arrow-point is late, and probably of the Bronze Age, I thought that its presence might be accidental. Since then, I have found several barbed arrow-points which unquestionably belong to the Earlier Series In fact, they seem more abundant in the Earlier Series than they are in the Later Series. I find that the experiences of other collectors in the district are the same as my own, Mr. F. N. Haward, in particular, having arrived independently at similar conclusions.

V.—THE CORRELATION OF THE PREHISTORIC "FLOOR" AT HULLBRIDGE.

I think that it is most probable that the implements from the prehistoric floor at Hullbridge belong to the Later Series, or are at least approximately contemporary with them. More detailed work will have to be done before one can speak with assurance. The buried surface at Hullbridge is, however, precisely similar to that of Eastern Essex, it is also similarly situated in the marsh deposits, and has every appearance of belonging to the same geological event. Some years since, a brickyard was opened in the marshes, not far from the Hullbridge site, and Mr. Rand informs me that at a considerable depth below the level of the prehistoric "floor" a number of large bones were found. I do not know what has become of these remains, but, from the description given by Mr. Rand, there seems little doubt that they belonged to the large Pleistocene mammalia. Thus, so far as one can judge, the whole succession appears to be similar in the two areas.

The technique of the flint industry from the Hullbridge "floor" is also in many respects strikingly similar to that of the Later Series of Eastern Essex, the chief difference noticed being in respect of the cores. At Hullbridge the cores are relatively rather more abundant than in East Essex. They also show a greater tendency to the production of the neat, prismatic,

"double-ended" form; that is, cores worked from both ends by parallel flaking. The divergence, however, is not very great.

Taking the evidence of the pottery, the agreement is not so close. It is worthy of note, however, that the pottery from different sites, and even from the same site, on the Buried Prehistoric surface of Eastern Essex, varies much, and yet it undoubtedly all comes within a narrow range of time. The pottery that I have so far found belonging to the Earlier Series in that district amounts to between sixty and eighty small fragments, most of them very small. I have very much more than this belonging to the Later Series. The earlier pottery varies far less in paste than that of the Later Series. It is always hand-made, it has much coarsely crushed flint in its composition, and is usually brown, or reddish brown, in colour. The later pottery is also hand-made, and is usually softer and darker in colour than the earlier. It sometimes contains crushed flint, and is then usually black in colour. The greater part of it, however, contains nei her crushed flint nor quartz grit in its composition. It is thick and soft and dark brown in colour, and not infrequently ornamented with finger-nail impressions. Besides these, I have also found fragments of the "Drinking-Cup," or Beaker pottery.[29]

The pottery which has been found at Hullbridge I am unable to precisely match with anything from Eastern Essex. It certainly more nearly resembles that of the Later Series than that of the Earlier, and it must be remembered that the former varies far more than the latter. It is coarse hand-made pottery, of primitive type, but is at the same time harder and better baked than that of the Later Series. There is also a suggestion of greater advancement about its curves.

After this paper was read at the meeting of the Essex Field Club on 17th December 1910, and before the manuscript had passed through the press, Mr. Rand wrote to me to say that the pottery which was shown at the meeting was not found on the principal floor below the bottom peat, but on a second surface above this lower peat. The greater number of the flint implements from Hullbridge have certainly come from the lower surface below the bottom peat. It thus transpires that the somewhat puzzling pottery which I could not precisely match

29 Hon. J. Abercromby, *Journ. Anthrop. Inst.*, vol. xxxii. (1902), p. 373.

with anything from Eastern Essex is really later than the majority of the other remains from the Hullbridge site. It does not belong to the Buried Prehistoric ["Lyonesse"] Surface, which is of such wide distribution. I have not traced this later stage in Eastern Essex. It is obvious that a second surface might easily be inhabited, after submergence had set in, in such situations as Hullbridge, which might well furnish a habitable surface when no such thing would have been possible in situations nearer the open sea. Some small fragments of pottery were also sent to me by Mr. Rand. This is soft, rather thin, very coarse, black, and with a great abundance of crushed flint. It is identical with a type not infrequently found among that of the Later Series of Eastern Essex. It was found by Mr. Rand, in the clay beneath the buried surface of Hullbridge. I should not wish to suggest from such slender evidence that the Hullbridge floor is itself later than my Later Series. The pottery in question may quite easily have got into this position through some slight disturbance of the ground, either by the hand of man, or by burrowing animals.

Upon reviewing the whole evidence, I do not think there can be any considerable difference between the age of the Hullbridge floor and that of the Buried Surface of Eastern Essex. And further, that if there be any difference in age between them, that the available evidence does not enable one to say upon which side it may lie.

VI.—THE AGE OF THE BURIED PREHISTORIC SURFACE AND THE CLASSIFICATION OF PREHISTORIC REMAINS.

I now come to consider the question of the actual age of the Buried Prehistoric surface, primarily of Eastern Essex, and secondarily of localities which appear to be approximately contemporary with it. That is to say, we now come to the problem as to where the archæological remains found upon that ancient surface should be placed in our prehistoric succession.

The geological position of the buried surface, beneath widely spread accumulations of tidal silt, is indicative of important changes in level. It is therefore so suggestive of profound antiquity that one is disposed, at the outset, to place it in the Neolithic age without any further consideration.

It appears to me that this change of level, resulting in the submergence of the low-lying lands of our coasts, may not be so far back as we might imagine. I think it not improbable that it is within the tribal memory of the earlier races who inhabited these islands, and who have now been driven into the West through the pressure of later immigrants. Legends and traditions do not arise without some foundation of fact, however much they may become distorted. It seems reasonable to suppose (although it is not capable of definite proof) that the legends of the land of Lyonesse,[30] which is traditionally supposed to have been overwhelmed by the sea, are simply the tribal memory of the submergence of this Buried Surface, upon which we now find the weapons, implements, domestic pottery, even the bones of our ancestors. That the traditions are now chiefly confined to Cornwall does not imply that the event only took place there, but that the descendants of those who witnessed the event have been driven into that district, and have taken the memory of this terrible calamity with them. Or it may be, perhaps, that in the eastern parts of England the original tradition has become fused with the later losses of land due to erosion, and not to submergence. Some of the traditions of Wales may possibly refer to the earlier event.

With regard to the geological problem of the time necessary for the deposition of the tidal silts which overlie the ancient surface, it must be confessed that we really do not know how rapidly this may take place under favourable conditions. Our notions of the slowness of deposition are largely coloured from the observance of those situations in which not deposition, but erosion, is actually in progress. Areas of rapid deposition are necessarily for the most part hidden from our sight. We only receive hints of what is going on from the silting up of estuaries and bays, and from the practical difficulties which are experienced in keeping open navigable channels by dredging operations, although in such situations the natural scour is very considerable.

One does not like to give a definite date to the Buried Prehistoric Surface. Any estimate of its age must be somewhat vague and uncertain. I do not think that the physical evidence demands a greater antiquity than some five thousand years from

30 W. A. E. Ussher, *Geol. Mag.*, dec. 2, vol. vi. (1879), p. 32.

the present time, while, from other considerations, a value of twice this amount is in the highest degree improbable. Indeed, the lower value is perhaps in excess of the necessities of the case.[31] If we said five thousand within a margin of error of fifteen hundred on either side, we should probably be fairly safe. This would give time for the deposition of the tidal silts, and would be in general agreement with the archæological evidence. It would also be within the keeping of tradition.

Another difficulty in considering whether the remains from the Buried Prehistoric Surface should, or should not, be called Neolithic, arises from the question of nomenclature. Before we are in a position to consider this problem, we must first ask the question: What is Neolithic?

In this country, it is customary to consider the Neolithic age to be a culture stage, subsequent to the Palæolithic Period, in which the working of metal was absolutely unknown. But if we follow the records of discovery, we cannot help being struck by the fact that at one Lake Dwelling or similar station after another, that has been regarded as Neolithic, Bronze has sooner or later turned up. There is a strong tendency in this country to thereupon transfer such a station to the Bronze Age. And this, in spite of the fact that it may still have far more in common with those stations where no bronze has yet been found than with those which belong to the fully developed Age of Bronze. Thus the reality of the prehistoric succession becomes confused or destroyed. It is somewhat disturbing to our conventional classification to observe how frequently bronze of local manufacture ultimately turns up in working supposed Stone Age sites.

I must confess that it seems to me that a pure and strict Neolithic age, to the total exclusion of all knowledge of metal, becomes a somewhat shadowy and uncertain quantity. The prehistoric succession depends rather upon the development of certain types, and the relative proportions in which they were used, than in the absolute presence or absence of metal.

The question of Neolithic or Bronze Age is thus by no means the simple one that it might at first sight appear. It raises at once very wide questions of classification and nomenclature,

31 If it be thought that my estimate is too moderate, an even lower one will be found in the new Memoir of the Geological Survey on the London District, by H. B. Woodward, 1909, p. 98.

questions which it appears to me it would be somewhat out of place to deal with fully in a paper such as this.

I will only say here that, if we take a fairly broad definition of the term Neolithic, as not excluding some knowledge of primitive metal working, then probably the Later Series of East Essex are Neolithic. If, on the other hand, we use a more strict definition of the term Neolithic to the absolute exclusion of all knowledge of metal, then it is doubtful if even the Earlier Series with their barbed arrow-points could properly come within its boundaries—if, indeed, such a period has ever existed.

What we want to recognise more thoroughly is that our prehistoric remains cannot be satisfactorily grouped into fixed periods, sharply marked off from each other. They form a developmental succession, and we need a system of grouping or classification which shall represent this in its true light.

The present writer has previously suggested that the Sequence Date System, which has been used with such success by Prof. Flinders Petrie in Egypt, should be adapted to the needs of the European succession.[32] The idea would be to take certain prominent stages in the succession, and to give to each of these certain arbitrary numbers representing "sequence dates." These would then form a standard of comparison for defining the relative ages of other remains. The following are the sequence dates which it was proposed to give to the more prominent stages in the prehistoric development. The only modification made here is the addition in brackets of integer numerals, which begin at 10 at the top, and work back on a uniform system into the Palæolithic Age.

Roman occupation	[10]	00
Epoch of La Tene (or late Celtic age)	[9]	90
Hallstaltien	[9]	80
Larnaudien (or Later Bronze Age)	[9]	70
Morgien (or Early Bronze Age)	[9]	60
Robenhausien (the "Neolithic" of continental authors)	[9]	50
Earlier Stage, perhaps pure Neolithic in part	[9] 30 to [9]	40
Period between the Palæolithic and Prehistoric ages	[8]	
Palæolithic Period, in various sub-stages	[7] 30 to [7]	90

In the paper referred to, I have endeavoured to point out some of the advantages that I believe we should find in the adoption of the Sequence Date System to define the relative

32 S. H. Warren, *Geological Magazine* (1902), p. 97.

ages of our prehistoric remains. I hope to deal with this subject and with the general problems of classification more fully in the near future. I can only, in this place, give the merest outline of the idea.

The first archæological unit taken into consideration in drawing up this scale is the axe. At s.d. 50,[33] the proportion of bronze axes (chiefly of the flat type) to those of stone is taken as 1 is to 100. At s.d. 60 the flat type of bronze axe still continues to predominate among those of metal, and the above proportion is taken as 50 is to 100. At s.d. 70 the socketed bronze axe was fully developed, and stone for the purpose of the axe had for the most part gone out of use.

The first metal axe was probably made of pure copper, and may have come in at s.d. 35–40, but this is a matter of much uncertainty. Metal ornaments would be in use still earlier.

Following this system a little further, and considering those points which are of special use to us in Eastern Essex, we find that the custom of cremation came in at or about s.d. 57, while the cinerary urn followed somewhat later, at about s.d. 61–62. The range of the "drinking cup" or beaker again seems to be about s.d. 55 to 62. That is to say, it ceased at about the time that the cinerary urn came in, and existed only while cremation was still very rare.

With regard now to the age of the two series of Eastern Essex. In the Later Series we have physical evidence of at least some considerable antiquity. We have the drinking cup or beaker, and advanced types of flint working. In another paper I show that we have contracted burial by inhumation, and I also give some evidence for the belief that cremation was likewise practised, and associated directly with the beaker. I have found no evidence of the cinerary urn, and do not think it likely that it would be present. Thus continuing to follow our scale, the place of the Later Series and of the Buried Prehistoric ["Lyonesse"] Surface falls at about s.d. 50 to 60. This is giving it an extreme range. Most probably it did not extend further than s.d. 57 or 58, at about which time the submergence must have taken place.

The Earlier Series, which appears to be separated from the

33 As the Palæolithic age does not concern us here, it is unnecessary to give the first integer numeral: it is understood that it is [9] in each instance.

beaker by some little space, we cannot place later than s.d. 50; nor, if the prevalent idea of the comparative lateness of the barbed arrow-point be correct, can we place it earlier than s.d. 40. This is, indeed, placing the barbed arrow-point somewhat early, but I do not see how the Earlier Series can be placed other than between the limits of these dates.

VII.—CONCLUSION: THE GENERAL CORRELATION OF THE BURIED PREHISTORIC SURFACE.

In the foregoing account, I have brought together the evidence relating to the Buried Prehistoric Surface of Essex, and of its extension northwards to Lincolnshire, and westwards to Devonshire, Somersetshire, and South Wales. I have endeavoured to show that although there are many buried surfaces of different ages, some dating from the close of the Pleistocene Period, there is yet one well-marked and widely-spread surface of special importance from an archæological point of view. For the sake of distinction, it is proposed to call this the "Lyonesse" surface, it being understood that its identification with the Lyonesse of tradition is purely conjectural. Strictly, it is only to be taken, as we take "Silurian," as a definite name for a definite thing.

This surface is commonly seen exposed beneath the peat at a level of about two to five feet above low water mark, but it of course rises higher than this, and merges into the present surface of the dry land of to-day, and it probably also descends considerably lower. Judging from the prehistoric remains that are found upon this surface, it appears that it was submerged beneath the sea at, or about, the "Sequence Date" of [9] 58, or slightly earlier.

This surface frequently lies upon rainwash or marsh clays containing prehistoric remains which do not seem to be earlier than between s.d. 40 and s.d. 50. Thus the remains on the "Lyonesse" surface are usually confined between the Sequence Dates 50 and 60 as their extreme limits. Sometimes, however, where the surface rests upon the country rock, some of its remains may date from an earlier stage.

There can be little doubt that the "floor" at Hullbridge comes generally into line with this surface as seen elsewhere.

At the same time, from its peculiarly sheltered position, at almost the head of the estuary, the site appears to have been inhabited to a somewhat later date than places nearer the more exposed sea-board. Its further investigation may be expected to yield important and interesting results, and Mr. Rand is certainly to be congratulated upon its discovery.

NOTE ON THE BISHOP'S STORTFORD SUB-FOSSIL HORSE SKELETON.[1]

A reply to Mr. E. T. Newton's Paper in ESSEX NATURALIST, vol. xvi., pp. 132—136.

By the REV. A. IRVING, D.Sc., F.G.S.

MR. NEWTON'S paper in the ESSEX NATURALIST, of which he has been recently good enough to send me a copy, is a very good *resumé* of Prof. Cossar Ewart's work, as that is expounded in the *Quarterly Review* for April 1907, although it is scarcely up to date. That able and illuminating article has been before me for the past two years, and Prof. Ewart knows my obligation to it, and to himself for the personal help and encouragement which he has so kindly given me in the investigation on which I have been engaged for the last two years, so far as time and opportunity have permitted. I may say that I set out with a sort of prejudice against the antiquity of the skeleton; and my letter in the *Standard* of 24th May, 1909, was merely a rough general statement of the facts that came to light in the inceptive stage of the enquiry. On that letter, therefore, it is only fair to say (1) that many of its suggestions were merely tentative and have had to be corrected from fuller knowledge; (2) that it would not have been written at the time had not my name been used by some irresponsible person, who sent "a short notice of the discovery" to the *Standard* after, perhaps, having overheard me "thinking aloud"; (3) that some corrections which I made to his misstatements were cut out of my letter for editorial reasons; (4) that the depth at which the skeleton was found was erroneously stated as 2½ feet from the surface, the real depth being 4 to 6 feet, the skeleton having been found lying in a horizontal position under the steep hill-slope—the position in fact in which

1 This paper is inserted at Dr. Irving's request.—ED.

it was photographed by Mr. H. G. Featherby, who, with his engineering resources, found no difficulty in erecting a temporary scaffold some 10 feet above it, from which he secured the excellent photograph which was reproduced in the *Illustrated London News* of 5th June 1909; (5) that all reference to the *Hipparion* was gratuitous, since the idea was merely suggested before the limb-bones were uncovered; (6) that I was perfectly aware that Pliocene beds had not been recognised by the Survey in this part of the country, though it was impossible for any one, with an acquaintance with the London Clay and the Reading Beds such as I have gained from between 30 and 40 years of field-work in them, to recognise the deposit in which the horse had been inhumed as belonging to either of those formations, which (as I was well aware) had been long recognised in the well-section at the town pumping-station, only 350 yards distant, and of which I will only say that doubts still linger in my mind as to the true geological horizon of at least one sub-formation included in that section, there being no fossil evidence to hand.

The skeleton was left lying at the bottom of the pond for several weeks, during which it was infamously damaged, although fortunately not until after Mr. Featherby had secured his excellent photograph, which has thus acquired a permanent value. On further examination of the hill-slope, and of the evident erosive action of a powerful high-level spring which must have been flowing from the drift-cap of the hill ever since glacial times, one was soon led to the conclusion that the pond excavation had not touched the London Clay behind the remanié material which the land-slides of the hill had brought down from higher levels, with mammalian bones, human artefacts, and a variety of stones from the drift-cap of the hill above, some of them undoubtedly "erratics." This conclusion was arrived at after the day's labour which was given to the removal of the entire skeleton, the bones of which were as black as those recovered this year from the bottom of the peaty alluvium of the Stort Valley. It was soon seen that the deposit in which the skeleton was found (utterly devoid of all trace of anything that could be associated with a modern horse) falls into line with the post-glacial "rubble-drift" series of deposits, which Prestwich, with his characteristic thoroughness,

described in the masterly paper which he gave to the Geological Society (vol. xlviii.) in 1892. The recognition of this "rubble-drift" age of the deposit has opened up a new chapter in the investigation of this upper Stort Valley, with some very interesting results.

The inferred position of the two sub-formations of the "London Clay" behind these landslides has since been demonstrated by four borings into the shoulder and cap of the hill, which Mr. Featherby executed under my direction in May 1910.

Professor Ewart's presentation of the question in *Nature* (19th August, 1909), in the light of the evidence then to hand, was absolutely fair. He left the question open, as he has done in his correspondence with me since that date; while he pointed to a difficulty which arose from the general assumption of the naturalists that "the native British horses, up to the coming of Cæsar, were too small to carry men." Further investigation (see *Report of the B.A.* for 1910, Sheffield Meeting, Sections C and H) has led to the recognition of a high degree of probability that this horse was a survival of a race which may or may not have been domesticated by the Neolithic men (as Nehring opines the horse was in Germany): and moreover it is fair to remark that one has seen with one's own eyes a whole troupe of some 33 ponies attached to Sanger's circus, about 11 hands high, who, as they trotted along in procession in beautiful sleek condition, seemed not to suffer the slightest inconvenience from the stud-grooms jumping astride first one and then another of them. Perhaps the later Celts (the Brython) were bad riders, and preferred to harness their steeds to chariots on that account, as I am not aware that they were a race of any greater stature than the Bulgar of the present day; possibly they were of less stature.

As to the non-acquaintance of Mr. W. H. Dalton (whose help in former years I gratefully remember) with what has come to light in recent years, through the more extensive opening-up of the district, it is impossible to attach any evidential evidence to that.

Mr. Newton will forgive me for pointing out what appears to me a slight technical inaccuracy in his paper. He speaks of the Steppe variety of horse (represented by *Equus prejwalskii*) as

having "23 dorso-lumbar vertebrae"; whereas I made out 19 dorsal and 5 lumbar vertebrae, when I counted them last year in the specimen of that horse which is to be found articulated in the North Gallery of the British Museum (Nat. Hist.) at S. Kensington.

How far Mr. Newton's statement that "the Bishop's Stortford horse-bones present no characters which would indicate their being of prehistoric age" can be justified, will appear when the paper which I read at Sheffield to Section H comes to be published *in extenso*.

NOTES—ORIGINAL AND SELECTED.

BIRDS.

Black Redstart at Bradfield, Essex.—As the Black Redstart (*Rubicilla titys*) is an unfrequent visitor to Essex, it is, I think, worth recording that one, a male bird, was about my garden and the neighbourhood for several hours of the afternoon of Wednesday, 22nd March last.—WALTER B. NICHOLS, M.B.O.U., *Stour Lodge, Bradfield, Manningtree.*

Mr. Christy (*Birds of Essex*) gives two references to the occurrence of the Black Redstart in Essex. Some interesting notes on the reputed nesting of the bird will be found in the ESSEX NATURALIST, ii., pp. 192 and 256, and vol. iii., p. 39.—*Ed.*

PLANTS.

Albinism in Essex Wild Flowers.—The Rev. Gilbert H. Raynor, Rector of Hazeleigh, near Maldon, writes as follows in the *Essex County Chronicle*:—"Now that Nature-Study has become so fashionable, there must be many among your readers who collect or study the wild flowers of their neighbourhood; and, with your permission, I should like to call their attention to the very charming *white* varieties of certain *pink* and *blue* flowers that may occasionally be found.

"Some of these, such as the White Bluebell (*Scilla nutans*) and the White Centaury (*Erythraea centaurium*), are so comparatively common as to call for little comment. They may be found in almost every locality where the typical plant abounds.

"Far more surprising are the pure white forms of the Great Hoary Willow Herb (*Epilobium hirsutum*), the Common Calamint

(*Calamintha officinalis*), and the Blue Bugle—all of which I have found during the last few years in this immediate neighbourhood. Truly astonishing, and for the moment even stupefying, are such sudden discoveries to one who, like myself, has roamed the fields and woods and lanes of Essex for more than 40 years, noticing, so far as may be, 'All things bright and beautiful, all creatures large and small.' Not much is to be gathered from botany books, either as to the number of British species of which these white varieties have been recorded or as to the organic cause of such albinism.

"If you feel inclined to grant the space, perhaps some of your readers will inform us what plants they have noticed as showing this tendency, and possibly some competent botanist will undertake the task of making out a list for the whole of Essex."

Claytonia perfoliata in Essex.—Referring to Mr. Shenstone's note in the last part of the ESSEX NATURALIST, I can add another locality for *Clatonia perfoliata*, viz :—In a lane leading from Dedham to Manningtree, where it has occurred for some years past in plenty, in company with *Geranium lucidum* (L.).—EDWIN E. TURNER, *Coggeshall.*

The "Bitter Cress," Cardamine amara in Essex.—Among the plants observed during a delightful country-side walk from Hatfield to Little Baddow, on 28th May 1910, was the somewhat-rare "Bitter Cress" (*Cardamine amara*), which was found in some quantity in a small brook at Little Baddow. The plant was long since recorded at Braintree by the celebrated naturalist John Ray. In *The New Botanist's Guide* (1837), the following Essex localities are given for it:—Copford (C. C. Babington M.S.S.); by the River above Chelmsford (*Mag Nat. Hist.*); Bog on Bentley Common, near South Weald; and about Braintree (*Botanist's Guide* Old Ed.?). At the present time, the plant may also be found near the Sheepen Bridge, Colchester (J. C. Shenstone), and between Hartford End and Felstead Mill (J. French). It is interesting to find that this somewhat-rare plant still occurs near our Essex streams.—J. C. SHENSTONE, F.L.S.

Some Interesting Plants at Ilford.—One would scarcely expect to associate the Ilford of the present day with anything of botanical interest, but it is a fact that one need not go

further south than a few hundred yards of St. Mary's Church (once the parish church of Ilford's village days and situated on the busy High Road of the present day) to meet with four plants which are still in the 9th Ed. of *Babington's Manual* (pub. in 1904) considered "rare." They are *Lepidium ruderale*, which literally covers certain rubbish heaps two minutes' walk from the church. *Erigeron canadense*, now a common weed, in almost every bare place in the neighbourhood. *Crepis taraxacifolia*, almost as common in the neighbourhood of what is known as the South Park (5 min. walk from the Church) as the *C. virens*. And *Senecio viscosa* fairly abundant in the same places. A mile or two further south, by the riverside on rubbish heaps belonging to the Coalite Company, *Salvia verticillata* is to be met with, as is the case also at Purfleet. This plant is not reported at the British Museum from any Essex locality. And to go still further afield, the writer has this year found *Lepturus filiformis*, which is a fairly uncommon Essex plant, and *Medicago sylvestris*, reported in Babington to be found "in sandy and gravelly places in Norfolk and Suffolk."

This last named plant, a solitary specimen, was in a field adjacent to the salt marshes near Shoeburyness, where the first-named plant was fairly abundant.—Rev. A. C. Morris, *St. Mary's Vicarage, Ilford*, 4 Aug. 1910.

Gregarious Fungus (*Peziza*) in Essex.—I met with this yesterday (1st January 1911), in rather striking circumstances. On the grass by the roadside, near a farm at Wakes Colne, in the Colne valley, a quantity of "cavings" and rubbish from a threshing machine had been thrown out for the chickens to scratch over. I think it was the result of threshing clover seed. Anyway, both patches (each of which was about ten feet across) were thickly grown over with this fungus, forming two brilliant orange masses and producing a very striking effect. The cups of the fungus were more extended when growing than they are now, which, of course, added to the effect produced. Mr. Massee informs me that the plant is *Peziza luteo-nitens* B. and Br. This is a fairly common species, generally gregarious, and often forming large sheets. He adds that it is believed by some botanists to be a small form of *Peziza aurantia* Pers.—Miller Christy, F.L.S.

MISCELLANEOUS.

A Nature Study Exhibition was held in the Essex Museum of Natural History during the months of June, July, and August.

A number of small tanks, placed in the room over the library, were used for demonstrating life in ponds and streams by means of an exhibition of living specimens of aquatic larvae of insects, water-spiders, pond-snails, newts, sticklebacks, etc. Half-a-dozen breeding-cages were fitted up, and crowds of delighted children were able to follow the various stages in the life-histories of some of the commoner butterflies and moths.

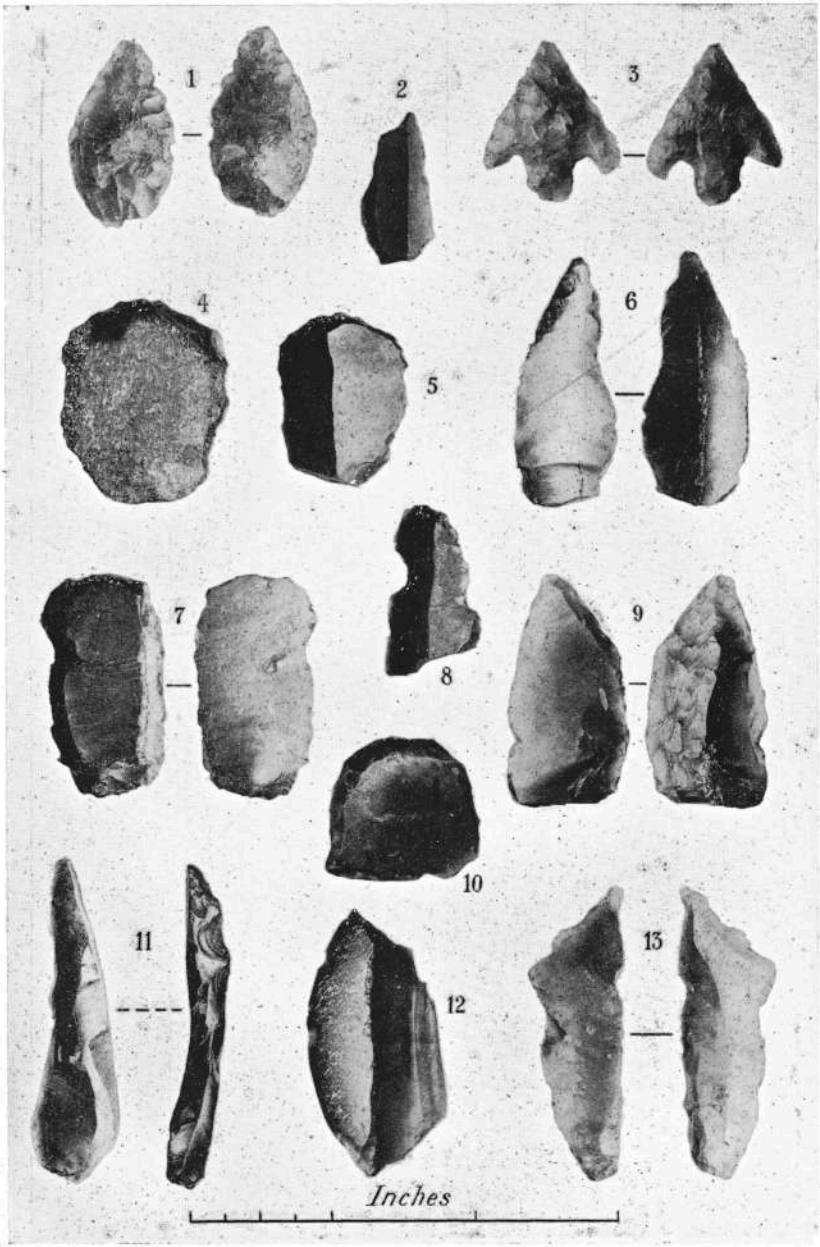
A series of "Nature Study Calendars" and studies of bird and plant life, prepared by the students of Bedford College, were also exhibited, through the kindness of Miss W. R. N. Holmer. This exhibit appealed particularly to those interested in methods of nature study teaching.

The exhibit of wild plants, which has now been held in the museum for some years during the summer months, was extended, and it was possible for one to study many representatives of our flora in various stages from bud to fruit. A number of dried preparations illustrated some of the methods of seed-dispersal. Photographic transparencies of wild plants in their natural surroundings were shown in the gallery. These photographs were taken by Mr. A. W. Dennis.

Epping Forest Notes.—Forest-Keeper Deery reports that during the past summer a Red hind and fawn have been seen on several occasions in Epping Forest. Some two or three years ago a hind escaped from Lady Bute's herd at Cheshunt, and it is conjectured that this may be the same animal.

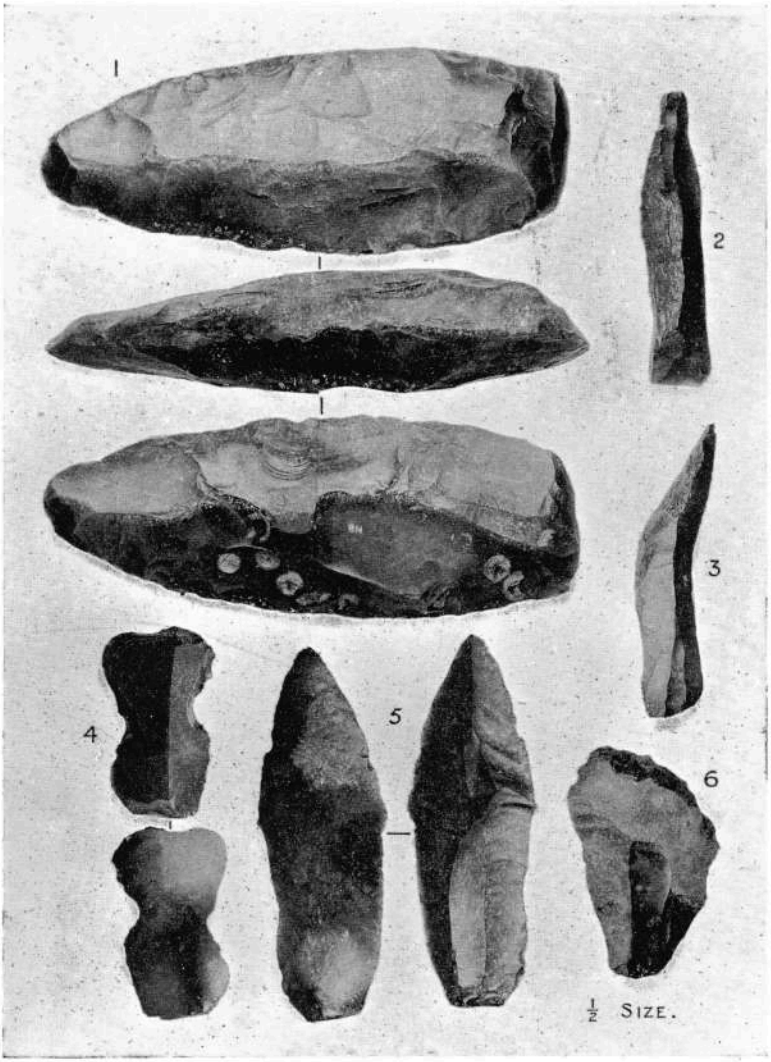
He also noticed a Fallow doe on 19th July, having the left side of her face, from nose to ear, quite white, the rest of the body being the normal dark, almost black, colour characteristic of the Forest deer.

On 5th July, the same keeper saw a Rook attack and kill a young Squirrel in Monk Wood. The bird struck the squirrel while in the top of a tree, and caused it to fall to the ground half-dead; whereupon the rook flew down and pecked it as it lay. —PERCY THOMPSON, *Loughton*, 28th November 1910.



FLINT IMPLEMENTS FROM HAMBOROUGH HILL.
(For description see text).

TWO VIEWS OF THE BED OF THE CROUCH AT HULLBRIDGE, SHOWING THE PEAT-BED (X) WHERE RELICS OCCUR.



FLINT IMPLEMENTS FROM THE PEAT-BED AT HULLBRIDGE.
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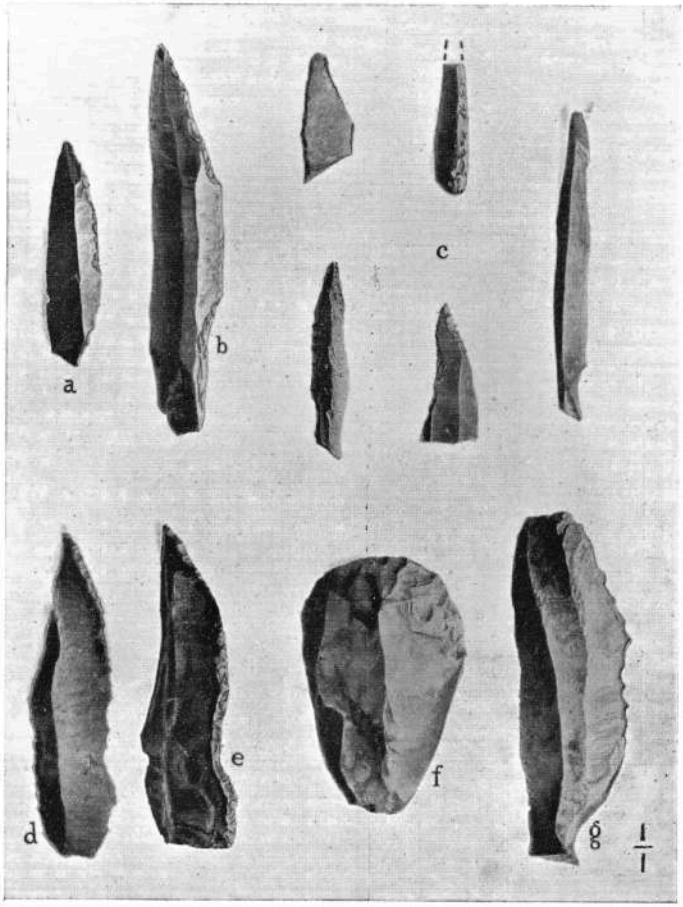
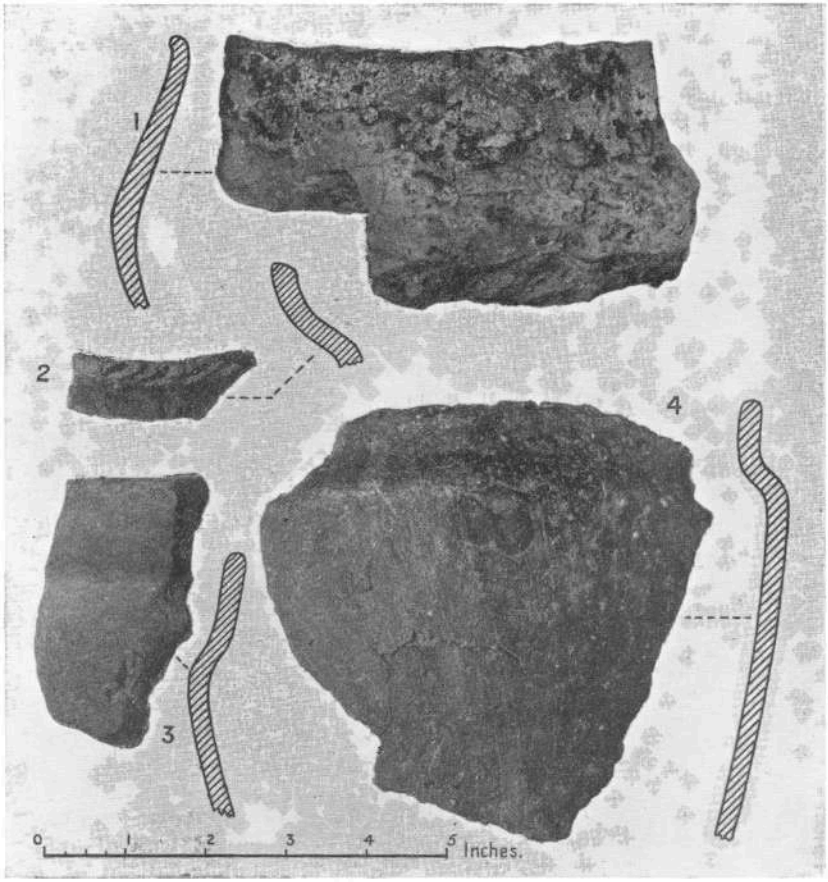


"PIGMY" AND OTHER FLINT IMPLEMENTS FROM HULLBRIDGE.
(For description see text).



POTTERY FROM THE PEAT-BED AT HULLBRIDGE.
(For description see text).

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